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ABSTRACT

This document addresses the benefits generated by New Jersey's 19 community colleges. Some of the benefits are students earning more money and society benefiting through avoided costs such as reduced welfare and unemployment, improved health, and reduced crime. The study is divided into the following four chapters: (1) overview of the benefits measured; (2) the major assumptions underlying the analysis; (3) presentation of the main socioeconomic, business, and statewide economic results; and (4) a sensitivity analysis of some the key assumptions and tracking the changes in the changes in the results as assumptions are changed. The authors address the fact that although all sectors of society benefit directly or indirectly through higher education, higher education requires a big investment. Therefore all education stakeholders (such as taxpayers, legislatures, employers, and students) want to know that they are getting their money's worth. To address this concern, the study investigates the attractiveness of the returns generated in the state relative to alternative public investments. The benefits are presented on three ways: (1) annual benefits; (2) present values of future annual benefits including rates of return and benefit/cost ratios; and (3) statewide economic benefits including returns to the business community. (MZ)

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The Socioeconomic Benefits Generated by New Jersey's 19 Community Colleges

Volume 1: Main Report

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M. Henry Robison & Kjell A. Christophersen

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Table of Contents

ACKNOWLEDGMENTS iii

ACRONYMS iv

Preface v

Chapter 1 INTRODUCTION 1

Overview 1

Annual Private and Public Benefits 3

Present Values of Future Benefits 3

Statewide Economic and Business Community Benefits 4

Chapter 2 DATA SOURCES AND ASSUMPTIONS 5

Introduction 5

Profile 5

Faculty, Staff, and Operating Budgets 5

The Students 6

Entry-Level Education, Gender, and Ethnicity 8

The Achievements 9

Annual Private Benefits 11

Annual Public Benefits 12

Higher Earnings 13

Health Savings 14

Crime Reduction Benefits 16

Welfare and Unemployment Reduction Benefits 17

Costs 18

Opportunity Cost of Time 19

The Budget 19

Other Assumptions 20

The Impact of New Jersey's Community College Operations 22

Estimating CHEs Embodied in the Present-Day Workforce 23

Reducing the CHEs to Account for Alternative Education Opportunities 24

From Embodied CHEs to Direct Statewide Income Effects 26

The Industries where Past Students Work 27

The Indirect Economic Development Effects of Students 29

Chapter 3 PRIVATE, PUBLIC, AND STATEWIDE ECONOMIC BENEFITS 31

Introduction 31

Annual Benefits 31

Higher Student Earnings 31

Social Savings 31

Health-Related Savings 31

Crime-Related Savings 32

Welfare and Unemployment Savings 32

Total Public Benefits 32

BEST COPY AVAILABLE

Annual Benefits Per CHE and Per Student 33

The Investment Analysis: Incorporating Future Benefits 34
The Student Perspective 37
The Broad Taxpayer Perspective 39
The Narrow Taxpayer Perspective 40
With and Without Social Benefits 43

Statewide Economic Benefits 45
Earnings Linked to Operation and Capital Spending 46
Past Student Economic Development Effects: The Direct Effect 47
Past Student Economic Development Effects: The Indirect Effect 50
Overall Effect of New Jersey's Community Colleges on the Statewide Economy 52

Chapter 4 SENSITIVITY ANALYSIS OF KEY VARIABLES 54

Introduction 54

The Student Employment Variables 54
Percent of Students Employed 55
Percent of Earnings Relative to Full Earnings 55
Results 55

Statewide Economic Development 56
The Economic Impact of Student Spending 57
Economic Impacts Reported as Gross Sales 58

The Attrition Rate 60

RESOURCES AND REFERENCES 62

Appendix 1: Explaining the Results—a Primer 67

The Net Present Value (NPV) 68

The Internal Rate of Return (IRR) 69

The Benefit/Cost Ratio (B/C) 70

The Payback Period 71

Appendix 2: Methodology for Creating Income Gains by Levels of Education 72

Appendix 3: Adjusting for the Benefits Available Absent State and Local Government Support 74

Introduction 74

State and Local Government Support Versus Tuition 74

From Enrollment to Benefits 76

The CC Shutdown Point 77

Adjusting for Alternative Education Opportunities 78

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The successful completion of this case study is largely due to excellent support from the staff of the New Jersey Council of County Colleges (NJCCC). The Council did a superb job organizing and managing the entire effort in short order. In addition, we are grateful for the work carried out by the 19 teams at the individual community colleges. Their enthusiasm for the project never wavered and their excellent questions and patience with our sometimes less-than-perfect draft report submissions challenged us to develop a better product in the end. Our special thanks go to Dr. Lawrence A. Nespoli of the NJCCC, who first promoted the study and made it all happen. We would also like to thank Ms. Linda Lam, also of the NJCCC, who acted as a liaison between us and the institutional reasearchers and business officers at the individual colleges. In addition, Lucy Schneider of our own staff contributed invaluable modeling and data collection expertise throughout the study period, along with our superb report production staff, Olivia Grauke and Annike Christophersen. Last, but by no means least, we would like to extend our thanks to Dr. Ray Taylor of the Association of Community College Trustees (ACCT) whose support through thick and thin has been steadfast. The creation of an economic modeling framework to provide low cost but rigorous economic impact analysis services for community and technical colleges was his vision, one on which he acted some three years ago. Any errors in the report are the responsibility of the authors and not of any of the above-mentioned institutions or individuals.

Dr. M. Henry Robison, Co- Principal
Dr. Kjell A. Christophersen, Co-Principal
CCbenefits, Inc.

CCbenefits Inc. is a company created in collaboration with the Association of Community College Trustees (ACCT) to provide economic analysis services to community and 2-year community colleges. Questions of a technical nature concerning the approach, assumptions, and/or results should be directed to CCbenefits, Inc., c/o Drs. Kjell Christophersen and Hank Robison, 1150 Alturas Dr., Suite 102, Moscow ID 83843, phone: 208-882-3567, fax: 208-882-3317, e-mail: ccbenefits@moscow.com.

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ACRONYMS

NJCCC	New Jersey Council of County Colleges
AD	Associate Degree
ABE	Adult basic education
ACCT	Association of Community College Trustees
B/C	Benefit/cost ratio
CC	Community College
CHE	Credit hour equivalent
ESL	English as a second language
GED	General Equivalency Diploma (also Education Development Certificate)
HS	High school
IO	Input-output analysis
IR	Institutional Researcher
NCF	Net cash flow
NPV	Net present value
REIS	Regional Economic Information System
RR	Rate of return
TC	Technical College
TD	Technical Diploma

Preface

The Association of Community College Trustees (ACCT) contracted with the authors in 1999 to create the model used in this study. The original vision was simple – to make available to colleges a generic and low cost yet comprehensive tool that would allow them to estimate the economic benefits accrued by students and taxpayers as a result of the higher education achieved. In short, it only makes economic sense for the students to attend college if their future earnings increase beyond their present investments of time and money; likewise, taxpayers will only agree to fund colleges at the current levels or increase funding if the economic benefits exceed the costs.

An important requirement of the ACCT vision was that the model reach far beyond the "standard" study – the computation of the simple multiplier effects stemming from the annual operations of the colleges. Although the standard study was part and parcel of the model ultimately developed, it was only a relatively small part. The current model also accounts for the economic impacts generated by past students who are still applying their skills in the workforce; and it accounts for a number of external social benefits such as reduced crime, improved health, and reduced welfare and unemployment, which translate into avoided costs to the taxpayers. All of these benefits are computed for each college, analyzed, and aggregated to produce this statewide report. The analysis is based on regional data adjusted to state situations to the greatest extent possible.

Although the written reports generated for each college are similar in text, the results differ widely. This, however, should not be taken as an indication that some colleges are doing a better job than others in educating the students. Differences among colleges are a reflection of the student profiles, particularly whether or not the students are able to maintain their jobs while attending, and the extent to which state and local taxpayers fund the colleges. Some students give up substantial earnings while attending college because employment opportunities are few and far between. In other cases they are able to work while attending because the area has an abundance of opportunities. Therefore, if the average student rate of return for College A is 15%, and the rate of return for College B is 20%, that does not mean that B is doing a better job than A. Rather, it is attributable to the employment opportunities in the region, and to the fact that one college may enroll more women than men, or minorities, and/or different kinds of students such as transfer, workforce or retired, etc. In turn, the student body profiles are

associated with their own distinct earnings functions reflecting these employment, gender and ethnicity differences. The location of the college, therefore, dictates the profile of the student body, which, to a large extent, translates into the magnitudes of the results. In this sense, it could be that College A, which has a 15% student rate of return, is actually a better or more efficiently managed school than College B, which has a 20% student rate of return. The qualitative difference in management efficiency is not equal to the difference between the two returns.

Chapter 1
INTRODUCTION

OVERVIEW

New Jersey's 19 community colleges (CCs) generate a wide array of benefits. Students benefit directly from higher personal earnings, and society at large benefits indirectly from cost savings (avoided costs) associated with reduced welfare and unemployment, improved health, and reduced crime. Higher education requires a substantial investment on the parts of the student and society as a whole, however. All education stakeholders—taxpayers, legislators, employers, and students—want to know if they are getting their money's worth. In this study, New Jersey's Council of County Colleges investigates the attractiveness of the returns they generate in the state (**Table 1.1** and **Figure 1.1**) relative to alternative public investments. The benefits are presented in three ways: 1) annual benefits, 2) present values of future annual benefits (rates of return and benefit/cost ratios, etc.), and 3) statewide economic benefits, including returns to the business community.

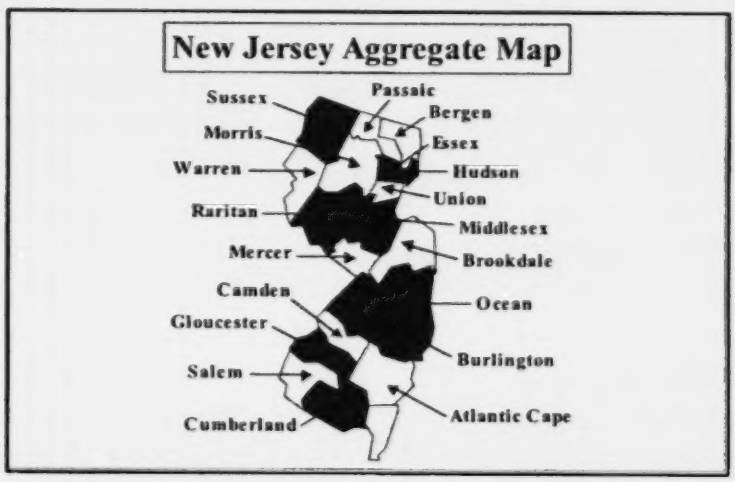
The study has four chapters and three appendices. **Chapter 1** is an overview of the benefits measured. **Chapter 2** details the major assumptions underlying the analysis. **Chapter 3** presents the main socioeconomic, business, and statewide economic results. Finally, **Chapter 4** presents a sensitivity analysis of some key assumptions—tracking the changes in the results as assumptions are changed. **Appendix 1** is a short primer on the context and meaning of the investment analysis results—the net present values (NPV), rates of return (RR), benefit/cost ratios (B/C), and the payback period. **Appendix 2** explains how the earnings related to higher education data were derived. **Appendix 3** provides a detailed technical/theoretical explanation of how benefits must be adjusted if the colleges can still stay open absent state and local government support.

Table 1.1. New Jersey Participating CCs and '01-02 Credit Enrollment

Name of College	Abbreviation	Credit Enrollment
Atlantic Cape Community College	ACCC	7,825
Bergen Community College	BCC	18,436
Brookdale Community College	BCC	18,214
Burlington County College	BCC	10,268
Camden County College	CCC	14,077
Cumberland County College	CCC	4,812
Essex County College	ECC	13,227
Gloucester County College	GCC	6,703
Hudson County Community College	HCCC	7,299
Mercer County Community College	MCCC	13,000
Middlesex County College	MCC	16,326
County College of Morris	CCM	12,291
Ocean County College	OCC	10,459
Passaic County Community College	PCCC	7,512
Raritan Valley Community College	RVCC	8,690
Salem Community College	SCC	1,417
Sussex County Community College	SCCC	2,175
Union County College	UCC	13,139
Warren County Community College	WCCC	1,521
Total		187,391

Note: Schools appearing in grey did not participate in the study of the individual CCs. Data for these schools was obtained from the New Jersey Council of County Colleges and estimated from trends in the participating schools.

Figure 1.1. Geographical Distribution of Participating CCs



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Annual Private and Public Benefits

Private benefits are the higher earnings captured by the students; these are well known and well documented in economics literature (see for example Becker, 1964 and Mincer 1958, plus many others listed in the references at the end of this report). Less well known and documented are the indirect benefits, or what economists call *positive externalities*, which are a collection of public benefits captured by society at large, such as improved health and lifestyle habits, lower crime, and lower incidences of welfare and unemployment. These stem from savings to society as taxpayer-provided services are reduced. We estimate dollar savings (or avoided costs) from reduced arrest, prosecution, jail, and reform expenditures based on published crime statistics arranged by education levels. Likewise, statistics that relate unemployment, welfare, and health habits to education levels are used to measure other savings. The annual economic impacts are presented in three ways: 1) per credit-hour equivalent (CHE), defined as a combination of credit and non-credit attendance[1], 2) per student, and 3) in the aggregate (statewide).

Present Values of Future Benefits

The annual impacts continue and accrue into the future and are quantified and counted as part of the economic return of investing in education. This lifetime perspective is summarized as *present values*–a standard approach of projecting benefits into the future and discounting them back to the present. The present value analysis determines the economic feasibility of investing in CC education—i.e., whether the benefits outweigh the costs. The time horizon over which future benefits are measured is the retirement age (65) less the average age of the students.[2]

The present values are also expressed in four ways: 1) net present value (**NPV**) total, per CHE, and per student, 2) rate of return (**RR**) where the results are expressed as a percent

[1]Instruction hours are not the same as credit hours. CCs prepare people both for jobs and for degrees. Many attend for short periods and then leave to accept jobs without graduating. Others simply enroll in non-academic programs. Nonetheless, the CHEs earned will positively impact the students' lifetime earnings and social behavior.

[2] Retirement at age 65 is only our assumption. In some areas people retire earlier, in others later. Whether they retire at 62, 65, or 67, this will not change the magnitudes of the results by much. The assumption only affects the time horizon over which the analysis is conducted.

return on investment, 3) benefit/cost (B/C) ratio – the returns per dollar expended, and 4) the payback period – the number of years needed to fully recover the investments made (see **Appendix 1** for a more detailed explanation of the meaning of these terms).

STATEWIDE ECONOMIC AND BUSINESS COMMUNITY BENEFITS

The benefits of a robust economy are many: jobs for the young, increased business revenues, greater availability of public investment funds, and eased tax burdens. The activities of New Jersey's 19 community colleges benefit state businesses directly by raising the skill level of the state labor force and providing opportunities for direct contract training of employees. State businesses benefit as well as the presence of a trained labor force works to attract new industry and increase the efficiency, competitiveness, and output of existing industry. All these together spell a more effective and robust state economy.

In this study we show the impact of New Jersey's 19 community colleges as a creator of earnings in the state economy. Increased earnings are displayed by industrial sector, and the role of New Jersey's CCs in the state economy is then indicated by the percentage of sector-by-sector earnings explained by the colleges. The geographic boundaries of the regional economy used in this report are shown in **Figure 1.1.** In general, these CC-linked earnings fall under two categories: 1) earnings generated by the annual operating expenditures of the colleges; and 2) earnings attributable to the CC skills embodied in the workforce.

Chapter 2
DATA SOURCES AND ASSUMPTIONS

INTRODUCTION

To the extent possible, documented statistics were used to estimate model parameters. In the few cases where hard data were scarce, however, the institutional researchers on the scene applied well-informed judgments and estimations on the basis of their intimate knowledge of their colleges and the student bodies.

This chapter contains six assumption sections, all based on various data imbedded in the analytic model: 1) the aggregate profiles of the 19 CCs; 2) annual earnings by education levels; 3) the social benefit assumptions (health, crime, and welfare/unemployment); 4) education costs; 5) other assumptions (the discount rate used, health, crime, and welfare cost statistics, etc.); and 6) assumptions pertaining to statewide economic effects.

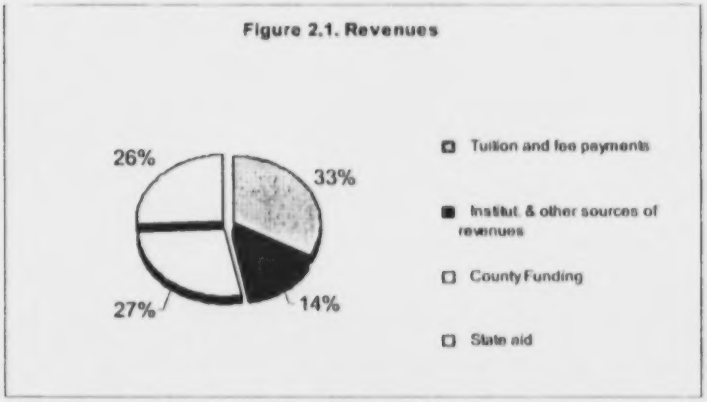
PROFILE

Faculty, Staff, and Operating Budgets

The New Jersey community colleges employed 6,506 full- and 6,679 part-time faculty and staff in fiscal year 2002 amounting to a total annual payroll of some $436.3 million. **Table 2.1** shows the aggregate annual revenues by funding source: a total of $789.0 million. Four main revenue sources are indicated. They include tuition and fees (32.9%), 14.1% from other sources (such as contract revenues, interest payments and the like), county funding (27.3%) and state aid (25.7%). These budget data are critical in identifying the annual costs of educating the CC student body from the perspectives of the students and the taxpayers alike. The same information is displayed in **Figure 2.1** in the form of a pie chart.

Table 2.1. Aggregate Revenues

Sources	Revenues	% of Total
Tuition and fee payments	$259,867,795	32.9%
Institut. & other sources of revenues	$110,882,510	14.1%
County Funding	$215,546,006	27.3%
State aid	$202,659,890	25.7%
Total	$788,956,201	100.0%



The Students

Students attend community colleges for different reasons: to prepare for transfer to four-year institutions, to obtain Associate Degrees or Certificates in professional/technical programs, to obtain basic skills, or perhaps to take refresher courses in non-credit programs – workforce students, for example. Students also leave for various reasons -- they may have achieved their educational goals or decided to interrupt their college career to work full-time. **Tables 2.2 - 2.4** summarize the student body profiles for the 19 CCs in the State of New Jersey. The unduplicated student body (headcount) is 288,067 (fiscal 2002 enrollment).

Some students forego earnings entirely while attending college while others may hold full or part-time jobs. Information about student employment plays a role in determining the *opportunity cost* of education incurred by the students while attending

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the New Jersey community college system[3]. **Table 2.2** rows labeled "% of students employed while attending college" and "% of full-time earning potential" provide the percentage estimates of the students who held jobs (80%) while attending college, and how much they earned (70%) relative to full-time employment (or what they would statistically be earning if they did not attend college). The former is a simple percent estimate of the portion of the student body working full or part-time. The latter is a more complex estimate of their earnings relative to their earning power if they did not attend college (i.e., recognizing that several students may hold one or more part-time jobs paying minimum wage while attending college).

Table 2.2. Student Body Profile

	Values
Total headcount of unduplicated credit students	187,391
Total headcount of unduplicated non-credit students	100,676
Total unduplicated enrollment, all campuses	288,067
% of students employed while attending college	80%
% of full-time earning potential	70%
Students remaining in state after leaving college	95%
30-year attrition rate (leaving state)	20%
"Settling In" factors (years):	
Completing Associate Degree	2.0
Completing Certificate	0.5
Non-completing transfer track	2.5
Non-completing workforce	0.0
ABE/ESL/GED	0.5

As indicated in the table, it is estimated that 95% of the students remain in the state (as defined in **Figure 1.1**) and thereby generate statewide benefits. The remaining 5% leave the state altogether and are not counted as part of the economic development benefits. The 95% retention rate applies only to the first year, however. We assume that 20% of the students, and thus associated benefits, will leave the state over the next 30 years due to attrition (e.g., retirement, out-migration, or death).

The last five items in **Table 2.2** are *settling-in* factors – the time needed by students to settle into the careers that will characterize their working lives. These factors are adapted from Norton Grubb (June 1999). Settling-in factors have the effect of delaying the onset of the benefits to the students and to society at large.

[3] The opportunity cost is the measure of the earnings foregone; i.e., the earnings the individual would have collected had he or she been working instead of attending any of the 19 New Jersey community colleges.

Entry-Level Education, Gender, and Ethnicity

Table 2.3 and **Figure 2.2** show the education level, gender, and ethnicity of the aggregate student body. This breakdown is used only to add precision to the analysis, not for purposes of comparing between different groups. Five education entry levels are indicated in approximate one-year increments, ranging from less than HS to post AD. These provide the platform upon which the economic benefits are computed.

The *entry level* characterizes the education level of the students when they first enter the colleges; this is consistent with the way most colleges keep their records. The analysis in this report, however, is based on the educational achievements of the students during the current year. As not all students reported in the enrollment figures for the fiscal year are in their first year of college, an adjustment was made to account for students who had accumulated credits during their community college experience and moved up from the HS/GED equivalent category. For this reason, the education levels of the student body must also be estimated for the beginning of the analysis year. Thus, of the 42,939 white males who first entered with HS/GED equivalent, it is estimated that only 10,179 still remain in that category at the beginning of the analysis year, meaning that 32,760 students have actually moved up from the "HS/GED equivalent" category to the "1 year post HS or less" category or beyond since they first entered the colleges.[4] (Note that the "Entry Level" and "Begin Year" columns always add to the same total.) Differences between the two columns reflect a redistribution of students from entry level to where they are at the beginning of the analysis year. The assumptions underlying the process of redistributing the students from the "Entry Level" to "Begin Year" columns are internal to the economic model – they are designed to capture the dynamics of the educational progress as the students move up the educational ladder beyond their initial entry level.

Table 2.3. Student Body Education Level: Entry vs. Beginning of Analysis Year

	White Male		Minority Male		White Female		Minority Female		Total	
Education Level	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year	Entry Level	Begin Year
< HS/GED	2,498	1,457	2,608	1,521	3,083	1,798	3,715	2,167	11,904	6,944
HS/GED equivalent	42,939	10,179	32,052	7,764	58,771	13,856	46,925	11,343	180,687	43,142
1 year post HS or less	12,492	28,278	6,463	20,217	12,361	36,826	11,980	30,072	43,296	115,392
2 years post HS or less	8,604	22,169	5,016	13,981	11,779	27,308	7,882	22,379	33,281	85,837
> AD	4,075	8,525	1,808	4,464	9,374	15,577	3,643	8,184	18,900	36,751
Total	70,609	70,609	47,946	47,946	95,367	95,367	74,145	74,145	288,067	288,067

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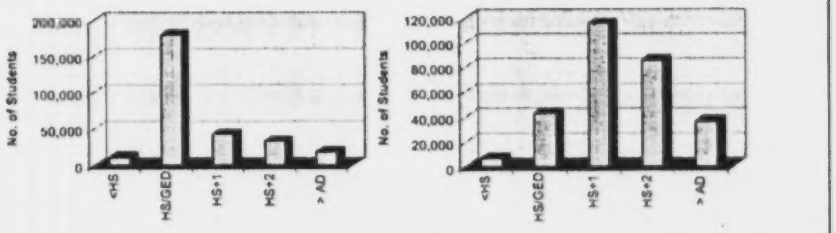
Figure 2.2. Student Body Education Level: Entry vs. Beginning of Analysis Year



The Achievements

Community colleges are geared to be responsive to the educational demands in their local communities, and they accommodate both credit and non-credit educational pursuits. **Table 2.4**, along with **Figures 2.3** and **2.4**, shows the student breakdown in terms of analysis year academic pursuits and/or achievements according to six categories: 1) retirees plus those attending (non-reimbursable) hobby and recreation courses, 2) Associate Degree completers, 3) Diploma and Certificate completers, 4) all transfer students, 5) all workforce students, and 6) ABE/ESL/GED students.[5]

The majority of students complete college credits, and either fulfill their educational needs, or return the following year to continue to work toward their goals (36.1% + 48.2% = 84.3% in the transfer track and workforce categories, respectively). The retired and leisure students (1.3%) and ABE/ESL/GED students (6.5%) complete the breakdown of the student body. The retired students are simply backed out of the analysis altogether on the assumption that they do not attend the community colleges to acquire skills that will increase their earnings. ABE/ESL/GED students are assumed to have a lower percentage impact than other students, because the end product of their education is to arrive at the "starting gate" on an equal basis with others. This does not mean that ABE/ESL/GED education has lower value; it simply means that these

[4] These calculations are based on parameters such as the frequency of "stopouts" and other parameters that characterize how typical CC students progress over time in their college career from when they first started up to the analysis year.

[5] ABE/ESL/GED = Adult basic education, English as a second language, and General Equivalency Diploma

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students must complete an extra step before they can compete effectively in the job market and reap the benefits of higher earnings.

The fourth column shows the average age of the students generating the benefits (excluding retirees). The time horizon for the analysis is 37.4 years, which is the difference between the average age (28.5 years) and retirement age (65 years).

As indicated in Column 5, the average Associate Degree and Certificate student completed 14.6 and 14.0 CHEs of study, respectively, during the analysis year. The total number of CHEs completed during the year of analysis for the entire system student body is 2.8 million. Finally, the last column shows the average timé the students are actually in attendance during the analysis year. This information is needed to determine the opportunity cost of their education.

Table 2.4. Levels of Achievement

Student Body	Student Distribution	Headcount Credit and Non-Credit	Avg. Age	CHEs This Year	Total CHEs	# Years Attend.
Retired and/or self-enrichment students	1.3%	3,864	69	4.7	18,170	0.16
Completing AD	4.8%	13,788	27	14.6	201,830	0.49
Completing Certificate	3.1%	9,019	30	14.0	126,566	0.47
Transfer track	36.1%	104,022	25	13.0	1,354,119	0.43
Workforce & non-credit	48.2%	138,734	31	7.4	1,026,481	0.25
ABE/ESL/GED	6.5%	18,640	31	5.4	101,336	0.18
Total or weighted averages	100.0%	288,067	28.5	9.9	2,828,502	
Credits required for one full-time year equivalent of study					30	

Note: weighted average of CHEs per year does not include the retired students

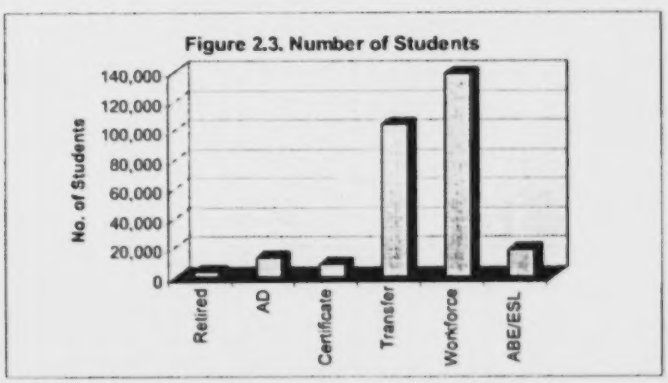

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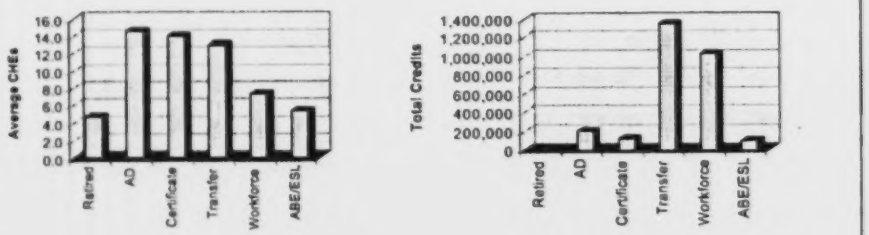
Figure 2.4. Average and Total CHEs Earned During the Analysis Year



ANNUAL PRIVATE BENEFITS

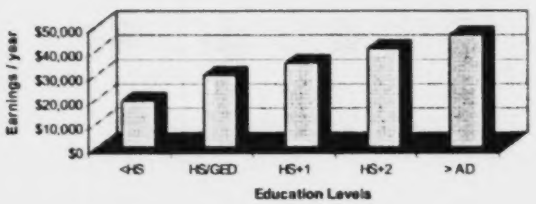
The earnings statistics in **Table 2.5,** on which the benefit estimates (reported in **Chapter 3**) are based, reflect all occupations (technical and non-technical). The earnings statistics are also displayed in **Figure 2.5**. The lower the education level, the lower the average earnings, regardless of the subject matters studied. The distinguishing feature among the achievement categories, therefore, is the number of CHEs completed. Statistics indicate that earnings are highly correlated with education, but correlation does not necessarily mean causation. Higher education is not the only factor explaining the private and public benefits reported in the statistics. Other variables such as ability, family background, and socioeconomic status play significant roles. The *simple correlation* between higher earnings and education nonetheless defines the *upper limit* of the effect measured. Our estimates of higher education's impact on earnings are based on a survey of recent econometric studies. A literature review by Chris Molitor and Duane Leigh (March, 2001) indicates that the upper limit benefits defined by correlation should be discounted by 10%. Absent any similar research for the social variables (health, crime, and welfare and unemployment), we assume that the same discounting factor applies as well to the public benefits.

As education milestones are achieved, students move into higher levels of average earnings. **Table 2.5** shows average earnings by one-year education increments, linked to the gender and ethnicity profile of the New Jersey community colleges' student body. The differences between the steps are indicated in the last column. We also assume that *all* education has value, and thereby attribute value to students completing less than full steps as well. Specific detail on **Table 2.5** data sources and estimating procedures is found in **Appendix 2.**

Table 2.5. Weighted Average Earnings

Entry Level	Average Earnings	Diff.
1 year short of HS/GED	$19,125	NA
HS/GED equivalent	$29,842	$10,717
1-year Certificate	$34,632	$4,790
2-year Associate Degree	$40,737	$6,105
1 year post Associate Degree	$46,397	$5,660

Figure 2.5. Average Earnings by Education Levels



ANNUAL PUBLIC BENEFITS

Both students and society at large benefit from higher earnings. Indeed, the principal motivation for publicly funded higher education is to raise the productivity of the workforce and the incomes that the students will enjoy once they complete their studies. Society benefits in other ways as well. Higher education is associated with a variety of lifestyle changes that generate savings; e.g., reduced welfare and unemployment, improved health, and reduced crime. Note that these are *external* or *incidental* benefits of education (see box). Colleges are created to provide education, not to reduce crime, welfare and unemployment, or improve health. The fact that these incidental benefits occur and can be measured, however, is a bonus that enhances the economic attractiveness of the college operations. It should not be taken to mean that taxpayers should channel more money to colleges on the strength of these external benefits. Our purpose is simply to bring to the attention of education stakeholders that the activities of the 19 colleges in the New Jersey system impact society in many more ways than simply the education they provide. In so doing, we have identified and measured some social benefits obviously related to educational achievements and included them in the mix of impacts generated by the colleges.

Assuming state and local taxpayers represent the public, the public benefits of higher education can be gauged from two perspectives, 1) a *broad* perspective that tallies all benefits, and 2) a *narrow* perspective that considers only changes in the revenues and expenditures of state and local government.

The Beekeeper Analogy

The classic example of a positive externality (sometimes called "neighborhood effect") in economics is that of the private beekeeper. The beekeeper's only intention is to make money by selling honey. Like any other business, the beekeeper's receipts must at least cover his operating costs. If they don't, he will shut down.

But from society's standpoint there is more. Flower blossoms provide the raw input bees need for honey production, and smart beekeepers locate near flowering sources such as orchards. Nearby orchard owners, in turn, benefit as the bees spread the pollen necessary for orchard growth and fruit production. This is an uncompensated external benefit of beekeeping, and economists have long recognized that society might actually do well to subsidize positive externalities such as beekeeping.

CCs are in some ways like the beekeepers. Strictly speaking, their business is in providing education and raising people's incomes. Along the way, however, external benefits are created. Students' health and lifestyles are improved, and society indirectly benefits from these just as orchard owners indirectly benefit from the location of beekeepers. Aiming at an optimal expenditure of public funds, the CCbenefits model tracks and accounts for many of these external benefits, and compares them to the public cost (what the taxpayers agree to pay) of CC education.

Higher Earnings

Broad Perspective: Higher education begets higher earnings. The economy generates more income than it would without the CC skills embodied in the labor force. From the broad taxpayer perspective, the total increase in earnings is counted as benefits of a community college education, adjusted down by the alternative education variable in **Table 2.9** (14.7%)—these students would still be able to attend college elsewhere even if the CCs were not present.

Narrow Perspective: Higher earnings translate into higher state and local *tax collections.* In the narrow taxpayer perspective we assume that the state and local authorities will collect 15.1% of the higher earnings in the form of taxes—the estimated composite of all taxes other than the federal income taxes.[6]

[6] The tax data are obtained from the U.S. Census Bureau. See also **Appendix 2**.

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Health Savings

The improved health of students generates savings in three measurable ways: 1) lower absenteeism from work, 2) reduced smoking, and 3) reduced alcohol abuse (**Table 2.6**; see also **Figures 2.6-2.8**). These variables are based on softer (i.e., less-documented) data. In general, statistics show a positive correlation between higher education and improved health habits. The table shows the calculated reductions in the incidences of smoking and alcohol abuse as a function of adding the higher education, also linked to the gender and ethnicity profiles of the aggregate student body. Recall from above, the health savings are reduced by 10% in recognition of causation variables not yet identified.

Broad Perspective: The benefits from reduced absenteeism are equal to the average earnings per day multiplied by the number of days saved (less the students covered by the alternative education variable, as above). These are benefits that accrue largely to employers. Smoking and alcohol-related savings accrue mostly to the individuals who will *not* have to incur the health-related costs. In the broad taxpayer perspective, however, these benefits accrued to employers and individuals are also public benefits.

Narrow Perspective: Taxpayers benefit from reduced absenteeism to the extent that the state and local government is an employer. Accordingly, we assume a taxpayer's portion of absenteeism savings at 11.5%, equal to the estimated public portion of employment in the state.[7] As for smoking and alcohol-related savings, the taxpayers benefit to the extent that state and local health subsidies (to hospitals, for example) are reduced. We assume that 6% of the total benefits can be counted as taxpayer savings.

[7] The ratio of state and local earnings over total earnings in the US (Regional Economic Information System—REIS, Bureau of Economic Analysis, Department of Commerce, 1998).

Table 2.6. Reduced Absenteeism, Smoking, and Alcohol Habits

	Absenteeism		Smoking		Alcohol Abuse	
Education Level	Days	%/Year	Average	Reduction	Average	Reduction
< HS/GED	6.8	2.6%	27.7%	NA	9.1%	NA
HS/GED equivalent	5.2	2.0%	25.4%	8.2%	8.4%	8.0%
1 year post HS or less	4.4	1.7%	23.4%	7.9%	7.8%	7.7%
2 years post HS or less	3.5	1.3%	20.6%	12.1%	6.8%	12.0%
> AD	3.0	1.2%	19.0%	7.5%	6.3%	7.7%

1. Absenteeism: U.S. Department of Labor, Bureau of Labor Statistics, Division of Labor Force Statistics, http://www.bls.gov

2. Smoking: a) National Center for Health Statistics. *Health, United States, 2001*, Table 61. Centers for Disease Control and Prevention, 2001. b) US Department of Treasury. *The Economic Costs of Smoking in the United States and the Benefits of Comprehensive Tobacco Legislation*. Report-3113, March 1998. http://www.treas.gov/press/releases/report3113.htm.

3. Alcoholism: a) National Center for Health Statistics. "Health Promotion and Disease Questionnaire of the 1990 National Health Interview Survey." b) National Institute on Drug Abuse (NIDA). *The Economic Costs of Alcohol and Drug Abuse in the United States – 1992*. http://www.nida.nih.gov/EconomicCosts/Index.html.

Figure 2.6. Days of Absenteeism by Education Levels

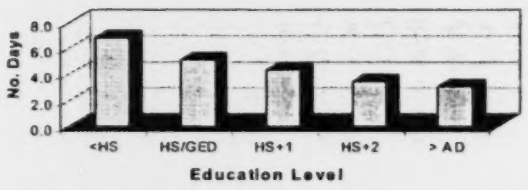
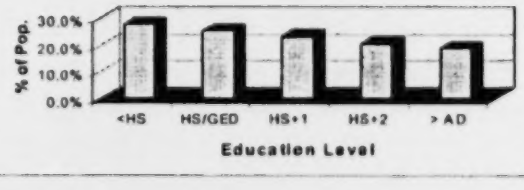
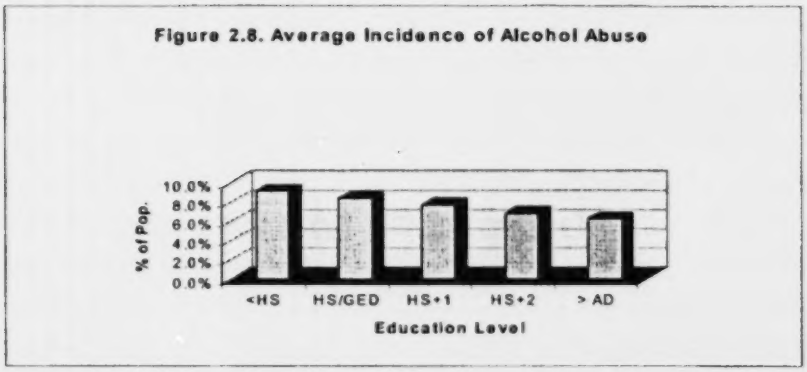


Figure 2.7. Average Incidence of Smoking by Education Levels





Crime Reduction Benefits

Table 2.7 and **Figure 2.9** relates the probabilities of incarceration to education levels—incarceration drops on a sliding scale as education levels rise (linked to the gender and ethnicity profile of the aggregate student body). The percentage reductions are based on total prison population relative to the population at large.[8] The implication is, as people achieve higher education levels, they are statistically less likely to commit crimes. The difference between before and after comprises the benefit attributable to education.

We identify three types of crime-related expenses: 1) the expense of incarceration, including prosecution, imprisonment, and reform, 2) victim costs, and 3) productivity lost as a result of time spent in jail or prison rather than working. As with our other social statistics, crime-related expenses are reduced by 10% in recognition of other causation factors.

Broad Perspective: From the broad taxpayer perspective, all reductions in crime-related expenses are counted as a benefit (less the students covered by the alternative education variable, as above).

Narrow Perspective: We assume that nearly all (80%) of the incarceration savings accrue to the state and local taxpayers—federal funding covers the remainder. Crime victim savings are avoided costs to the potential victims, not to the taxpayers. As such, we claim none of these as taxpayer savings. Finally, we apply our "composite" state and local government average tax rate (15.1%) to the added productivity of persons *not* incarcerated to arrive at the taxpayer benefits.

[8] See also Beck and Harrison: http://www.ojp.usdoj.gov/bjs/abstract/p00.htm.

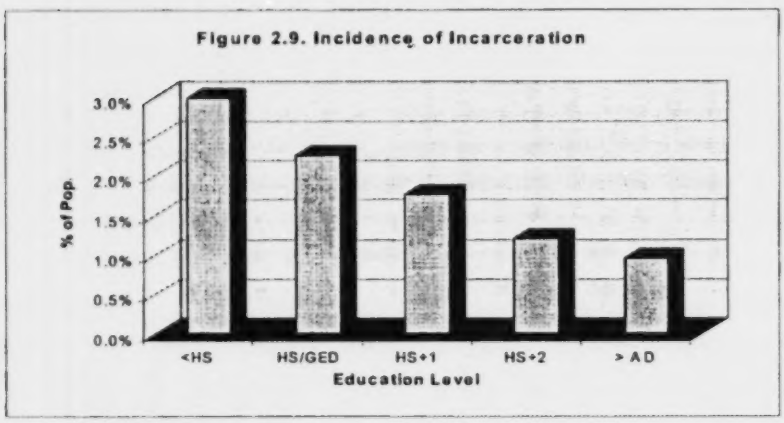
Table 2.7. Incarceration Rates

Education Level	Average	Reduction
< HS/GED	3.0%	NA
HS/GED equivalent	2.3%	24.1%
1 year post HS or less	1.8%	21.7%
2 years post HS or less	1.2%	31.7%
> AD	1.0%	20.6%

1. Haigler, Karl, et al. *Literacy Behind Prison Walls*. National Center for Education Statistics. NCES 94102, December 1994.

2. Bonczar, T. P. and Alan J. Beck; *Lifetime Likelihood of Going to State or Federal Prison*, US Department of Justice, Office of Justice Programs, March 1997.

3. Bureau of Justice Statistics. Criminal Justice Expenditure and Employment Extracts Program (CJEE), December 2000. http://www.ojp.usdoj.gov/bjs/eande.htm#selected.



Welfare and Unemployment Reduction Benefits

Higher education is statistically associated with lower welfare and unemployment. **Table 2.8** and **Figure 2.10** relate the probabilities of individuals applying for welfare and/or unemployment assistance to education levels (linked to the gender and ethnicity profiles of the student bodies). As above, all welfare and unemployment savings are reduced by 10% in recognition of other causation factors.

Broad Perspective: Reduced welfare and unemployment claims are counted in full as benefits in the broad taxpayer perspective (less the students covered by the alternative education variable, as above).

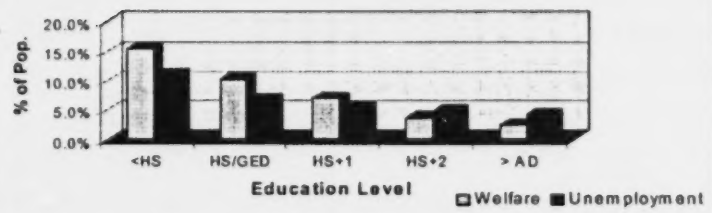
Narrow Perspective: Taxpayer benefits from reduced welfare are limited to 16%--the extent to which the state and local taxpayers subsidize the welfare system. None is claimed for unemployment, because none of these costs are borne by the state taxpayers.

Table 2.8. Welfare and Unemployment

	Welfare		Unemployment	
Education Level	Average	Reduction	Average	Reduction
< HS/GED	15.6%	NA	11.0%	NA
HS/GED equivalent	10.4%	33.5%	6.8%	38.4%
1 year post HS or less	7.1%	31.4%	5.4%	19.5%
2 years post HS or less	3.8%	46.6%	4.9%	10.8%
> AD	2.5%	33.5%	4.3%	11.6%

1. Temporary Assistance for Needy Families (TANF). *Third Annual Report to Congress*, Table 10:12. US Department of Health and Human Services, August 2000.
2. Rector, Robert (Testimony). *Means-Tested Welfare Spending: Past and Future Growth*. Heritage Foundation, March 07, 2001.

Figure 2.10. Welfare and Unemployment



COSTS

There are two main cost components considered in the analytic framework: 1) the cost incurred by the student, including expenses for tuition and books, and the opportunity cost of his or her time (represented by the earnings foregone while attending college), and 2) the cost incurred by state and local government taxpayers, which is part of the colleges' operating and capital costs (the budget—see **Table 2.1**). These are briefly discussed below.

Opportunity Cost of Time

The opportunity cost of time is, by far, the largest cost. While attending college, most students forego some earnings, because they are not employed or are employed only part-time. The assumptions are discussed in conjunction with **Table 2.2** above. For the non-working students, the opportunity cost is the full measure of the incomes not earned during their CC attendance. For students working part-time, the opportunity cost is the difference between what they could make full-time less what they are making part-time. No opportunity cost of time is charged for the fully employed. The opportunity costs are derived from the earnings categories by education entry levels given in **Table 2.5**, although with some important modifications, as briefly described below:

- The earnings in **Table 2.5** are averages based on trajectories of earnings for all ages, from 17 to 65 (roughly defining the time spent engaged in the workforce).

- The average earnings, therefore, define the midpoint of a working life trajectory that begins with low entry-level wages and culminates with a typical worker's highest wages around age 60.[9] The earnings data shown in **Table 2.5** are specific to the State of New Jersey, weighted, however, to reflect the specific gender and ethnicity makeup of the aggregate student body. Details on earnings and education sources are found in **Appendix 2**.

- The opportunity cost of time is then conditioned by the average age of the student (28.5 years, see **Table 2.4**). In particular, the average earnings at the midpoint (**$35,076** in **Table 3.5**) are adjusted downward to $21,381 to reflect the average earnings at age 28.5.

The Budget

Beyond the student perspective, our assessment of the New Jersey community colleges considers the benefits and costs from the state and local government taxpayer perspective. Accordingly, only the state and local government revenues in **Table 2.1** are included as costs in the investment and benefit/cost assessment. All else equal, the

[9] This profile of lifetime earnings is well documented in labor economics literature, see for example, Willis (1986), supported by the well-respected theoretical and empirical work of Becker (1964) and Mincer (1958).

larger the other revenue sources in **Table 2.1** (federal grants, student tuition, and contract revenues) relative to state and local government revenues, the larger will be the relative economic payback to the taxpayers.

OTHER ASSUMPTIONS

Table 2.9 lists several other assumptions imbedded in the analytic model: a) the discount rate and time horizon, b) crime-related costs (incarceration costs are inclusive of the cost per prison year plus all costs associated with arrest, investigation, trial and finally incarceration), c) welfare and unemployment costs per year,[10] and d) health-related costs.[11] The alternative education opportunity assumption is discussed later in this chapter in association with the statewide economic impacts.

Table 2.9. Miscellaneous Variables

	Variables
Discount rate	4.0%
Time horizon, years to retirement	36.5
Average cost per prison year (arrest, trial, incarceration, rehab. etc.)	$77,178
Average length of incarceration (total years)	4.0
Average victim cost	$ 85,000
Average cost per welfare year	$ 75,138
Average duration on welfare (total years)	4.0
Average cost per unemployment year	$ 36,249
Average duration on unemployment (total years)	4.0
Smoking-related medical costs per year	$ 2,962
Alcohol-related medical costs per year	$ 7,946
Alternative education opportunities	14.7%

Assumptions adapted from:

1. Bureau of Justice Statistics. Table 05 : "Total direct and intergovernmental expenditure, by activity and level of government, fiscal years 1980-97." Criminal Justice Expenditure and Employment Extracts Program (CJEE), December 2000.
2. Office of International Criminal Justice (OICJ). "The Extent and Costs of Victimization, Crime and Justice." *The Americas* , Dec-Jan 1995.
3. Rector, Robert (Testimony). *Means-Tested Welfare Spending: Past and Future Growth* . Heritage Foundation, March 07, 2001.
4. U.S. Department of Labor. Bureau of Labor Statistics, http://www.bls.gov/news.release/annpay.t01.htm.
5. US Department of Treasury. *The Economic Costs of Smoking in the United States and the Benefits of Comprehensive Tobacco Legislation* . Report-3113, March 1998.
6. National Institute on Drug Abuse (NIDA). *The Economic Costs of Alcohol and Drug Abuse in the United States – 1992* , 1992.

[10] As indicated in the table, we assume that the average duration on welfare and unemployment is 4.0 and 4.0 years, respectively. This means that, over the next 30 years or so, the cumulative incidence of welfare and/or unemployment will be spread evenly over the time horizon—it is not a consecutive period.
[11] The incarceration, health, welfare and unemployment probability, and cost variables are internal to the analytic model.

STATEWIDE ECONOMIC BENEFITS

In general, the statewide economy is affected by the presence of the 19 community colleges in New Jersey in two ways: from their day-to-day operations (including capital spending), and from students who enter the workforce with increased skills. Day-to-day operations of the colleges provide the *direct* jobs and earnings of the faculty and staff, and additional *indirect* jobs and earnings through the action of regional multiplier effects. At the same time, the presence of college-trained past and present students in the state workforce deepens the economy's stock of human capital, which attracts new industry and makes existing industry more productive.

Estimating these statewide economic effects requires a number of interrelated models. Multiplier effects are obtained with an input-output (IO) model constructed for New Jersey.[12] Estimating CC operations effects requires an additional model that takes CC expenditures, deducts spending that leaks from the economy, and bridges what is left to the sectors of the IO model.

Estimating the skill-enhancing effect of past students on the statewide economy entails five basic steps:

1. Estimate the number of past students still active in the statewide workforce.
2. Adjust for alternative education opportunities.
3. Estimate the increased earnings of the students still active in the statewide workforce.
4. Adjust the overall earnings estimated in step 3 to account for a collection of substitution effects. This provides an estimate of the direct increase in statewide earnings.

[12] The economic impact model for the 19 community colleges in New Jersey is constructed using IMPLAN input-output modeling software, and data purchased from the Minnesota IMPLAN Group. IMPLAN is the most widely used approach for constructing input-output models. The IMPLAN website (www.implan.com) boasts of over 1,300 active database and software users in the United States as well as internationally. IMPLAN users include federal and state government, universities, as well as private sector consultants.

5. Allocate the direct increase in statewide earnings to affected economic sectors, and augment these to account for a collection of demand and supply-side multiplier effects.

The end results include estimates of the impact of past student skills and increased productivity on: a) the size of state industries, and b) the size of the overall statewide economy.

This section is divided into a number of subsections. The first documents our estimation of day-to-day college operations effects followed by sections that detail the steps necessary to estimate the effect of past student skills on the statewide economy.

The Impact of New Jersey's Community College Operations

The first step in estimating the impact of the 19 New Jersey CC operations is to assemble data on their combined operating and capital expenditures. These data are assembled from college records and collected into the categories of **Table 2.10**. Column 1 simply shows the total dollar amount of spending. Columns 2 through 5 apportion that spending to in-state and out-of-state vendors. The net state portion is derived in Column 6.[13]

The information on total spending required for Column 1 is generally readily available, though sorting specific items to the categories of the table can take some time. Information in Columns 2 through 5 is generally more problematic: hard data are scarce on the local/non-local split. In these cases, the staff members of the 19 New Jersey community colleges were asked to use their best judgment.

The first row in **Table 2.10** shows salaries and wages. These *direct* earnings are part of the state's overall earnings by place-of-work; these appear later as "Direct Earnings of Faculty and Staff" in the table of findings, **Table 3.16**. Dollar values in **Table 2.10**, Column 6, "Net In-State Spending," are fed into the economic region IO model. The IO model provides an estimate of indirect effects, and these appear as "Indirect Earnings" in **Table 3.16**.

[13] **Table 2.10**, by itself, might provide useful information to local audiences—Chambers of Commerce, local business establishments, Rotary clubs, and the like. The table indicates that the colleges are "good neighbors" in the state community, evidenced by the fact that an estimated 92% of all college expenditures benefit state vendors ($656,707 / $717,527 = 92%).

Table 2.10. Profile of CCs Spending in and out of State Economy ($ Thousands)

Spending Categories	Tot. Dollar Amount (1)	In-State % (2)	Out of State % (3)	In-State % (4)	Out of State % (5)	Net In-State Spending (6)
Salaries and wages	$436,313	98%	2%			$428,624
Travel	$5,561	68%	32%			$3,782
Electricity and natural gas	$18,363	79%	21%			$14,581
Telephone	$4,532	68%	32%			$3,101
Building materials & gardening supplies	$1,002	63%	37%	41%	59%	$636
General merchandise stores	$43,894	76%	24%	35%	65%	$33,374
Eating & drinking	$202	100%	0%			$202
Maintenance & repair construction	$14,195	82%	18%			$11,708
New construction	$49,894	95%	5%			$47,336
Insurance	$41,090	71%	29%			$29,114
Legal services	$1,715	93%	7%			$1,592
Credit agencies	$2,695	72%	17%			$1,934
U.S. postal service	$3,544	63%	37%			$2,236
Accounting, auditing & bookkeeping	$2,200	83%	17%			$1,826
Marketing	$5,839	92%	8%			$5,377
Other business services	$35,993	71%	29%			$25,610
Water supply & sewerage systems	$2,162	99%	1%			$2,138
Printing & publishing	$4,312	89%	11%			$3,828
Rental property	$3,736	97%	3%			$3,638
Services to buildings	$7,044	91%	9%			$6,407
Unemployment compensation	$804	94%	6%			$753
Honoraria + other payments to households	$32,437	89%	11%			$28,911
Total	$717,527					$656,707

Note: this table provides details for the summary of the college role in the state economy (Table 3.16)

Estimating CHEs Embodied in the Present-Day Workforce

This section describes the submodel for estimating the CHEs of past instruction embodied in the present-day statewide workforce from the 19 community colleges in New Jersey. **Table 2.11** indicates variables critical to the model, while **Table 2.12** shows the various steps in the calculation. The various values appearing in **Table 2.11** originally appear in **Table 2.2** and **Table 2.4**. Considering **Table 2.12** one column at a time reveals the steps involved in estimating embodied CHEs.

Column 1 provides an estimate of the enrollment history (unduplicated headcount) of the students enrolled in New Jersey's 19 community colleges. Column 2 represents the non-retired students, in other words, the students who have the potential to go into the workforce. Column 3 is the same as Column 2, but net of students who leave the state immediately upon leaving college. As shown in the table, 95% of the students remain in the state upon leaving the CCs, and 5% leave the state.

Column 4 goes one step further – a comparison of Columns 3 and 4 indicates that all past students have left college except for the last three years (1999-2002) where students are still enrolled (the leaver assumptions are shown in Column 9).

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Column 5 further reduces leavers to focus only on those who have settled into a somewhat permanent occupation. As shown in Column 10 (the "settling factor"), it is assumed that all students settle into permanent occupations by their fourth year out of school. Settling-in assumptions are specified in **Table 2.2** above.

Column 6 transitions further from leavers who have settled into jobs to leavers still active in the current workforce. Here we net off workers who, subsequent to leaving college and settling into the state workforce, have out-migrated, retired, or died. As shown in **Table 2.11**, 20% of the past students will out-migrate, retire or die over the course of the next 30 years. This "30-year attrition" follows an assumed logarithmic decay function shown in Column 11 labeled "active in state workforce."

Column 7 shows the average CHEs generated per year back to 1973. These data were obtained by dividing total year-by-year CHEs by the corresponding headcount.[14] Column 8 shows the product of the year-by-year average CHEs, and the estimate of the number of past students active in the current workforce in Column 6. Looking to the total in Column 8, we estimate that the current New Jersey workforce embodies some 55.0 million CHEs of past instruction from the 19 community colleges.

Table 2.11. Critical Variables

Assumptions	Values
Current headcount of students	288,067
Students remaining in-state after leaving New Jersey's CCs	95%
30-year attrition	20%
Decay rate	0.7%
Overall average of credits earned per student this year	9.9

Reducing the CHEs to Account for Alternative Education Opportunities

The 55.0 million CHEs of past instruction from the 19 New Jersey CCs indicated in **Table 2.12** increase the skills embodied in the statewide workforce and, through them, the overall size of the state economy in terms of earnings. Before turning to the income calculation, however, it is fair to ask to what degree past students would have been able to obtain schooling (and therefore skills) absent the community college system in New Jersey. This is the common "with and without condition" in applied economic analysis.

[14] We used the current year estimate of CHEs (see **Table 2.4**), adjusted for the retired students, as a proxy for the average achievement per student in all prior years before FY 2002.

The IR staffs provided the estimate of the alternative education opportunity variable (14.7%) by taking into account opportunities such as private trade schools and colleges, public four-year institutions, correspondence schools, and so on. Accordingly, when calculating the net increase in regional income attributable to New Jersey's CCs, the historic CHEs indicated in **Table 2.12** are reduced by 14.7%.

Table 2.12. Estimating Credit Hours of Instruction Embodied in the Workforce

									Assumptions		
	Student Enrollment Headcount	Subtract Retired Students	Subtract Students Migrating Immediately	Students who have left college (Leavers)	Leavers Who Have Settled Into Jobs	# Settled Into Jobs - Active in the Workforce	Average Credit Equivalents	Credits Embodied in the Workforce	% of Students in Workforce	"Settling" Factor	Active in Workforce
Year	1	2	3	4	5	6	7	8	9	10	11
1973	153,315	151,256	143,695	143,695	143,695	114,956	9.89	1,136,742	100%	100%	80%
1974	159,995	157,849	149,957	149,957	149,957	120,861	9.89	1,195,131	100%	100%	81%
1975	167,725	165,479	157,201	157,201	157,201	127,646	9.89	1,262,220	100%	100%	81%
1976	177,026	174,651	165,918	165,918	165,918	135,739	9.89	1,342,162	100%	100%	82%
1977	182,241	179,796	170,806	170,806	170,806	140,772	9.89	1,392,018	100%	100%	82%
1978	184,626	182,149	173,042	173,042	173,042	143,679	9.89	1,420,766	100%	100%	83%
1979	190,192	187,641	178,259	178,259	178,259	149,115	9.89	1,474,525	100%	100%	84%
1980	194,613	192,002	182,402	182,402	182,402	153,720	9.89	1,520,060	100%	100%	84%
1981	203,513	200,783	190,744	190,744	190,744	161,951	9.89	1,601,446	100%	100%	85%
1982	225,213	222,192	211,083	211,083	211,083	180,558	9.89	1,785,439	100%	100%	86%
1983	228,986	225,914	214,618	214,618	214,618	184,952	9.89	1,828,898	100%	100%	86%
1984	228,757	225,689	214,404	214,404	214,404	186,147	9.89	1,840,715	100%	100%	87%
1985	224,594	221,581	210,502	210,502	210,502	184,124	9.89	1,820,704	100%	100%	87%
1986	223,647	220,647	209,615	209,615	209,615	184,716	9.89	1,826,565	100%	100%	88%
1987	223,912	220,908	209,863	209,863	209,863	186,316	9.89	1,842,384	100%	100%	89%
1988	224,829	221,813	210,722	210,722	210,722	188,478	9.89	1,863,738	100%	100%	89%
1989	233,975	230,836	219,294	219,294	219,294	197,607	9.89	1,954,033	100%	100%	90%
1990	241,748	238,503	226,578	226,578	226,578	205,695	9.89	2,034,012	100%	100%	91%
1991	253,138	249,742	237,255	237,255	237,255	216,996	9.89	2,145,760	100%	100%	91%
1992	261,537	258,028	245,127	245,127	245,127	225,869	9.89	2,233,505	100%	100%	92%
1993	271,646	268,002	254,602	254,602	254,602	236,352	9.89	2,337,158	100%	100%	93%
1994	278,154	274,422	260,701	260,701	260,701	243,820	9.89	2,411,013	100%	100%	94%
1995	273,799	270,126	256,619	256,619	256,619	241,795	9.89	2,390,982	100%	100%	94%
1996	274,436	270,755	257,217	257,217	257,217	244,167	9.89	2,414,444	100%	100%	95%
1997	265,538	261,976	248,877	248,877	248,877	238,015	9.89	2,353,602	100%	100%	96%
1998	251,853	248,475	236,051	236,051	236,051	227,434	9.89	2,248,972	100%	100%	96%
1999	250,784	247,430	235,058	235,058	235,058	228,168	9.89	2,256,231	100%	100%	97%
2000	258,017	254,556	241,828	241,706	217,535	212,735	9.89	2,103,624	100%	98%	98%
2001	275,319	271,625	258,044	252,238	189,178	186,385	9.89	1,843,085	98%	75%	99%
2002	288,067	284,203	269,993	229,494	114,747	114,747	9.89	1,134,672	85%	50%	100%
Embodied Total								55,014,586			

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From Embodied CHEs to Direct Statewide Income Effects

In the standard model, statewide income is expressed as a function of physical and human capital. Human capital is increased by adding new workers or by enhancing the skills of existing workers – the former adds the productivity of the new workers; the latter increases the productivity of existing workers. Increased human capital has a direct and indirect effect on *statewide income*. The direct effect is conveyed in the higher earnings of the newly skilled workers themselves, while the indirect stems from associated multiplier effects. This section describes our process for estimating the direct effect.

A key part of the overall model is the "engine" that estimates the value per CHE of instruction.[15] The product of per-CHE added earnings, and the total of embodied past CC instruction from the 19 New Jersey community colleges (55.0 million CHEs, **Table 2.12**) provides the dollar estimate of how much more past students are earning as a result of their CC coursework. The question is: how much of this added *personal* income can be counted as added *statewide* income?

The answer to this question depends on the magnitude of certain elasticity assumptions at work in the statewide income model. As shown in the text box, the elasticities can vary from perfectly inelastic to perfectly elastic. The text box describes the issue according to "two polar cases," one accepting all of the added student income, the other accepting none of it. Obviously the actual value will lie somewhere between. How much of increased past student income should be counted as increased regional income?

[15] Briefly, the engine that estimates the value per CHE does so by combining earnings/education data from **Table 2.5** with information on aggregate student achievements during the analysis year (from **Table 2.4**). These calculations are discussed more fully in **Chapter 3**.

There is considerable empirical literature on the economic development effects of education, though mainly in the international rather than regional context. In a recent study, Bils and Klenow (2000) survey previous work on the subject and advance a model of their own. Based on their findings, we reduce the full past student income increase (the perfectly inelastic case) by 2/3 to arrive at our estimate of the net increase in statewide income. This estimate for New Jersey's CCs appears in **Table 3.16** under the heading "Earnings Attributable to Past Student Economic Development Effects," "Direct Earnings."

Elasticity of Substitution: Two Polar Cases

Polar Case 1, Two Inelastic Assumptions.

Assumption #1: *The rate of technical substitution between local skilled and unskilled workers is infinitely inelastic.* Skilled workers are able to perform tasks that unskilled workers cannot. Here, the added skills only increase value; they do not replace or substitute for existing production inputs. The added skills enable product line expansion, increased competitiveness of existing industry, and they attract new industry. Earnings and output expand as a result.

Assumption #2: *The rate of technical substitution between local and non-local workers is infinitely inelastic.* Skilled workers cannot be attracted from outside the state. Here, the existence of state skilled workers enables industry to do things they could not do otherwise. Locally skilled workers may attract new industry to the state (there is a near stand-alone development theory based on the notion that skilled workers attract new industry – Borts and Stein, 1964).

Polar Case 2, Two Elastic Assumptions.

Assumption #1: *The rate of technical substitution between local skilled and unskilled workers is infinitely elastic.* This implies that skilled workers are substituted for unskilled workers in a manner that creates no net additional regional earnings. Businesses simply replace lower productivity (and lower paid) unskilled workers with some smaller number of higher productivity (and higher paid) skilled workers, with no net change in overall output or earnings.

Assumption #2: *The rate of technical substitution between local and non-local workers is infinitely elastic.* Here existing or new industry can draw skilled workers from outside the state without extraordinary inducements or wage premiums that would otherwise increase costs and reduce competitiveness. Statewide growth is driven by something other than local workforce skills. Hamilton et al., 1991, provides a broad discussion of the issues that work to limit the response of statewide income to specified economic changes.

The Industries where Past Students Work

Calculating the indirect impacts of workforce-embodied CC skills also requires the use of the statewide IO model discussed above. The model captures the extent to which a dollar spent turns over in the economy. We estimate indirect income effects by applying the IO multiplier to the direct effects. The

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use of IO multipliers in this way requires that the direct effects be disaggregated into specific industrial sectors. Disaggregating direct impacts avoids IO aggregation error,[16] and it facilitates an analysis of the contribution of New Jersey's 19 community colleges to the business sector – an analysis that appears in **Chapter 3**.

Table 2.13 provides information on the sectoral distribution of jobs in the statewide economy. The table provides a draft-stage vehicle for collecting information from New Jersey's 19 community colleges on the sectoral breakdown of their past students, and it documents the information provided by the colleges. **Table 2.13** appears with four columns briefly described below.

Column 1 appears for reference and simply shows by sector the current distribution of *all jobs* in the state economy. For example, 1.2% of all statewide jobs are in the Agriculture and Agricultural Services sector, 9.6% of all jobs are in the Finance, Insurance and Real Estate sector, and so on. Column 2 shows the distribution by sector of *past students*, i.e., an estimate of the industries where they currently work. For example, while 1.2% of all statewide jobs are in the Agriculture and Agricultural Services sector, only 0.1% of past students are estimated to be in that sector. In contrast, while 9.6% of all jobs are in the Finance, Insurance and Real Estate sector, 17.3% of past students are estimated to be in that sector.

There is a long-standing theory of regional development known as *stage theory*. The notion is that regional economies develop by progressing from "low stage industries" (agriculture, mining, logging, etc.), to "higher stage industries" (process manufacturing, fabricative manufacturing), and finally to specialized finance, engineering, and so on. The distribution of past students shown in column 2 is derived mechanically, on the assumption that past students tend to find jobs in the higher development stage industries.[17]

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[16] Aggregation error occurs when a model with many industrial sectors is reduced through industry combination to a model with many fewer "aggregated industries" (see Miller and Blair, 1985, Chapter 5). Our initial estimate of past student direct earnings effects appears with no industry detail, and would thus require aggregating all industries to a single aggregate. By any measure, use of such an aggregated multiplier would court an unacceptable aggregation error. At the same time, the IMPLAN IO modeling system conveys industry detail at roughly the SIC 4-digit level. An assembly of data on direct past student effects at this fine level of detail is not realistic. Our solution is to disaggregate past student direct effects to the nineteen sectors appearing in **Table 2.13**.

[17] Parr (1999) describes four stages of economic development: primary production, process manufacturing, fabricative manufacturing, and producer services and capital export. We apply a

In the course of assembling the data for our analysis, the 19 New Jersey community colleges have examined the distribution of past students as indicated in Column 2, and made any adjustments needed to accurately reflect the current realities. The revised distribution appears in Column 3. In the case of New Jersey, the research staffs at the colleges have concluded that no changes to the mechanical estimates appearing in Column 2 were needed.

Column 4 applies the distribution of student percentages in Column 3 to the total historic CHEs embodied in the workforce. This latter total is obtained from **Table 2.12**, and reappears at the bottom of Column 4 as the total. In **Chapter 3**, we estimate the contribution to student earnings per CHE of CC instruction. This product provides our estimate of the direct effect of past CC operations on regional earnings by industry.

The Indirect Economic Development Effects of Students

The previous section described how we estimated the increment of statewide earnings directly attributable to the CC skills embodied in the current region workforce. Next, we turn to the indirect effects on both the demand and supply- sides.

First, consider demand-side effects. Statewide earnings are larger because of the skills embodied in past students from the 19 New Jersey CCs still active in the workforce. As earnings increase, so do industry outputs and industry purchases of inputs.[18] These in turn generate subsequent rounds of increased earnings, which are measured with the familiar multiplier effects. These indirect effects on the demand-side are estimated in the statewide IO model by converting the embodied CHEs shown in **Table 2.13** into direct increased industry sales.

Second, consider the supply-side indirect effect. Economic development theory describes a process of "cumulative causation," or "agglomeration," whereby growth

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"development score" to Parr's stages: low scores for lower stage sectors and higher scores for higher development sectors. The scores are applied to employment in each sector, then normalized to form weights for distributing past students. The end result is that past students favor higher stage industries. For additional detail on the use of this approach for classifying industries by industrial stage, see Rutgers 2002.

[18] For example, associated with the increased output and earnings is an increased demand for both consumer goods and services, and goods and services purchased by businesses as inputs. These in turn produce a set of statewide economic multiplier effects. These are all captured and included as part of the demand-side indirect effects.

becomes in some degree self-perpetuating. The location of a new industry (A) in the state attracts other industries (B, C, and D) that use industry A's outputs as inputs. This, in turn, produces subsequent rounds of industry growth, and so on.[19] To estimate agglomeration effects, we configure our economic region IO model to provide a set of so-called supply-driven multipliers (see for example Miller and Blair, 1985). We estimate the supply-side effects by converting the embodied CHEs shown in **Table 2.13** into direct increased industry value added, and then apply these to the multipliers of the supply-driven statewide IO model.[20]

Table 2.13. Estimating the Distribution of Past Students by Industrial Sectors of the Regional Economy

Industries	Distribution of All Jobs 1	Provisional Distribution of Past Students 2	Final Distribution of Past Students 3	Distribution of Historic CHEs Embodied in Current Workforce 4
Agriculture and Agricultural Services	1.2%	0.1%	0.1%	60,871
Mining, Sand, and Gravel	0.1%	0.0%	0.0%	3,835
Construction	4.4%	0.4%	0.4%	220,243
Manufacturing: Food, Wood, Paper, and Textiles	2.4%	1.1%	1.1%	603,940
Manufacturing: Chemicals, Petroleum, Stone, and Glass	5.3%	4.8%	4.8%	2,655,480
Manufacturing: Computer and Electronic Equipment	0.7%	1.2%	1.2%	672,023
Manufacturing: Other	1.3%	1.1%	1.1%	623,168
Transportation	3.6%	1.6%	1.6%	896,074
Public Utilities	0.4%	0.2%	0.2%	89,235
Publishing and Communications	2.5%	4.5%	4.5%	2,480,246
Trade	21.5%	19.4%	19.4%	10,685,892
Finance, Insurance, and Real Estate	9.6%	17.3%	17.3%	9,504,841
Motels, Eating/Drinking, and Amusement/Recreation	7.0%	3.1%	3.1%	1,730,683
Consumer Services	4.4%	2.0%	2.0%	1,083,122
Business Services	10.9%	9.9%	9.9%	5,421,888
Medical, Educational, and Social Services	12.1%	21.9%	21.9%	12,069,150
Federal Government	2.0%	1.8%	1.8%	1,012,076
State and Local Government	10.7%	9.5%	9.5%	5,201,820
Total	100.0%	100.0%	100.0%	55,014,586

[19] For a more complete discussion of agglomeration and cumulative causation see Krugman (1999).
[20] Agglomeration effects are difficult to estimate. Our procedure assumes that so-called "supply-driven IO multiplier effects" capture the agglomeration effects. To increase the plausibility of this assumption, we apply only the direct effects associated with the industries in the highest stages of development.

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Chapter 3
PRIVATE, PUBLIC, AND STATEWIDE ECONOMIC BENEFITS

INTRODUCTION

This chapter summarizes the main study results in four sections: 1) the aggregate annual private and public benefits; 2) these same benefits measured per CHE and per student; 3) future benefits expressed in terms of NPV, RR, and B/C ratio, and 4) the statewide economic benefits.

ANNUAL BENEFITS

Higher Student Earnings

The annual benefits are summarized in **Tables 3.1** and **3.2** (see also **Figure 3.1**). We begin with earnings growth in **Table 3.1**. Last year, each student completed, on average, 9.9 CHEs at the 19 New Jersey CCs (see **Table 2.4**), only a fraction of one full year of study. This is because the majority of students attend for a variety of purposes as discussed in conjunction with **Table 2.4**: for some, to make progress towards an eventual degree, and for others, simply to acquire certain skills that will increase their productivity in the workforce. A total of 288,067 students will capture $436.7 million worth of higher annual earnings based on this average increase in educational attainment.

Social Savings

Health-Related Savings

Also in **Table 3.1**, we see that improved health, lower welfare and unemployment, and lower crime will result in annual dollar savings to the taxpayers of $23.6 million, $21.1 million, and $14.6 million (rounded). In **Table 3.2**, these same results are presented in greater detail – health-related absenteeism will decline by 81,356 days per year, translating to a total of 313 years' worth of productivity gained per year (based on 260 workdays per year). Annual total dollar savings from reduced absenteeism days equals $10.2 million. There will be 2,381 fewer smokers and 797 fewer alcohol abusers,

amounting to annual total dollar savings of $7.1 and $6.3 million, respectively, inclusive of insurance premiums, personal payments, and withholding for Medicare and Medicaid.

Crime-Related Savings

There will be 517 fewer people incarcerated as a result of the higher education obtained, saving the taxpayers a total of about $5.6 million per year. The assumptions pertaining to these results are listed in **Table 2.9** in the previous chapter. They are based on an average duration of 4.0 years incarcerated at an average cost of $77,178 per year (inclusive of arrest, prosecution, incarceration, and rehabilitation). Fewer people incarcerated means more people gainfully employed – this translates to $2.9 million in additional annual earnings for the state. Victim costs will be reduced by $6.2 million per year.

Welfare and Unemployment Savings

There will be 3,105 and 1,069 fewer people on welfare and unemployment, respectively, in the community. The corresponding total dollar savings for the state community amounts to $21.1 million ($12.3 million for welfare + $8.8 million for unemployment savings) for one year, assuming that the average time spent on welfare and unemployment is 4.0 years (see **Table 2.9**) spread over a 30-year period.

Total Public Benefits

All told, there will be $59.4 million in public savings per year in the community – the sum of all health, crime, and welfare/unemployment benefits in **Table 3.2**.

Table 3.1 Student Body Achievements, Higher Earnings and Social Benefits

		Social (External) Benefits			
Level of Education	Higher Earnings	Improved Health	Lower Crime	Lower Welfare Unemployment	Total
< HS/GED	$9,179,438	$416,390	$373,954	$1,009,706	$10,979,488
HS/GED equivalent	$11,785,175	$305,574	$253,775	$772,720	$13,117,244
1 year post HS or less	$181,692,076	$12,706,538	$8,770,779	$12,821,593	$215,990,987
2 years post HS or less	$175,078,728	$7,665,001	$4,203,687	$4,972,177	$191,919,593
> Associate Degree	$58,947,851	$2,538,738	$1,034,174	$1,533,691	$64,054,454
Total	$436,683,268	$23,632,241	$14,636,369	$21,109,888	$496,061,766

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Table 3.2. Summary of Annual Benefits

	Units	Earnings	Social Savings
Higher earnings	NA	$436,683,268	
Health benefits			
Absenteeism savings (days)	81,356	NA	$10,249,589
Fewer smokers, medical savings (# persons)	2,381	NA	$7,052,134
Fewer alcohol abusers (# persons)	797	NA	$6,330,518
Crime benefits			
Incarceration savings (# persons)	517	NA	$5,604,953
Crime victim savings	NA	NA	$6,173,015
Added productivity (fewer incarcerated)	NA	NA	$2,858,401
Welfare/unemployment benefits			
Welfare savings (# persons)	3,105	NA	$12,320,708
Unemployment savings (# persons)	1,069	NA	$8,789,180
Total		$436,683,268	$59,378,498

Figure 3.1. Higher Earnings and Social Savings per Year

Annual Benefits Per CHE and Per Student

The aggregate benefits reported in **Tables 3.1** and **3.2** above are expressed per CHE and per student in **Table 3.3**. These are also displayed in the form of a pie chart in **Figure 3.2**. On average, students capture: a) $155 per year in higher earnings per CHE,[21] and b) $1,516 per year in higher earnings per student on the basis of the number of CHEs completed. **Converted to a full-year equivalent (30 CHEs), the annual earnings would amount to $4,599 per student**. On average, the social benefits per CHE range from a low of $1 for Added Productivity to a high of $5 per CHE for Medical Cost Savings. On a per student basis, they range from a low of $10 per student for Added Productivity to a high of $46 for Medical Cost Savings. On a full year equivalent basis (30 CHEs), the

[21] Thus, a student attending for 10 CHEs will add $1,554 per year to the lifetime earnings. A longer curriculum will add substantially more. The earnings expectations are portrayed as linear but with many computational steps involved (see **Chapter 2**). The extrapolation is based on the averages of low earnings additions for leavers completing few CHEs, plus higher additions for leavers completing more CHEs.

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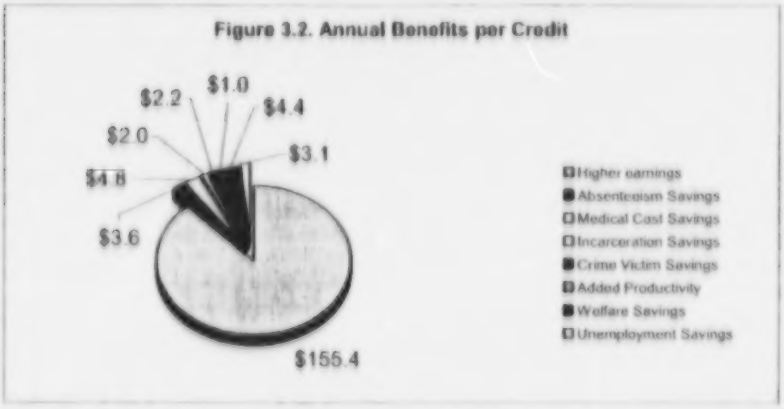
social savings would amount to $625 per student (the total of $5,224 less $4,599 of higher private earnings as indicated in **Table 3.3**).[22]

Table 3.3. Annual Benefits Per Credit and Per Student

	Per Credit	Per Student	Annualized
Higher earnings	$155.4	$1,516	$4,599
Absenteeism Savings	$3.6	$36	$108
Medical Cost Savings	$4.8	$46	$141
Incarceration Savings	$2.0	$19	$59
Crime Victim Savings	$2.2	$21	$65
Added Productivity	$1.0	$10	$30
Welfare Savings	$4.4	$43	$130
Unemployment Savings	$3.1	$31	$93
Total	$176.5	$1,722	$5,224

Note: The annualized values exclude benefits from retired students.

Figure 3.2. Annual Benefits per Credit



The Investment Analysis: Incorporating Future Benefits

The results in **Tables 3.1** and **3.2** provide only a single-year snapshot of the benefits. As long as the students remain in the workforce, however, the CC-acquired skills continue to add productivity over time. In the investment analysis, the higher earnings and avoided costs are projected into the future over the working life of the student, discounted to the present, and then compared to the present costs of education. The

[22] The values in **Table 3.3** and **Figure 3.2** are calculated based on the various statistical sources referenced in **Table 2.9**, in conjunction with the student profile and headcount numbers provided by the college.

investment is feasible if all discounted future benefits are greater than or equal to the costs.[23]

The investment analysis results are shown in **Table 3.10** (in the aggregate, per CHE, and per student). The end results sought are the **Net Present Value (NPV)**, **Rate of Return (RR)**, the **Benefit/Cost (B/C)** ratio and the **Payback Period**.[24] These are simply different ways of expressing the results. All of the present value results shown are intermediary steps that *ultimately generate* the NPVs, RRs and B/C ratios.

We begin with some definitions in **Table 3.4. Private** benefits are the higher earnings captured by the students themselves. **Broad taxpayer benefits** are the additions to earnings plus lower overall expenditures related to health, crime, welfare, and unemployment. **Narrow taxpayer benefits** include increased state and local tax revenues (from increased incomes), and savings from reduced state and local government expenditures for incarceration, health, and welfare.

[23] Future benefits are worth less than present benefits. The present value of $5,000 to be received 30 years from today is worth only $1,603 given a 4% discount rate ($5,000/(1.04)^{30} = $1,603). If the same benefits occur each year for 30 years, each year's benefit must be discounted to the present, summed and collapsed into one value that represents the *cumulative* present value of all future benefits. Thus, the present value of 30-years' worth of $5,000 per year is $90,000.

[24] The criteria for feasibility: a) NPV must be positive or equal to zero; b) RR must be equal to or greater than the returns from other similar risk investments; c) the B/C ratio must be equal to or greater than 1; and d) the payback period is the number of years of benefits required to fully recover the investment made.

Table 3.4. Some Definitions

Terms	Definitions
Student (Private) Benefits	Higher earnings captured by the students
Taxpayer Benefits: Broad	Additions to earnings plus lower overall expenditures related to health, crime, welfare, and unemployment
Taxpayer Benefits: Narrow	Increased state and local government tax collections plus lower expenditures related to health, crime, welfare, and unemployment
Student Costs	Tuition (**Table 2.1**) plus the opportunity cost of time
Taxpayer Costs	Taxes (state and local, see **Table 2.1**)
Results:	
Student Perspective	Student Benefits / Student Costs
Taxpayer Perspective: Broad	Taxpayer Benefits (Broad) / Taxpayer Costs
Taxpayer Perspective: Narrow	Taxpayer Benefits (Narrow) / Taxpayer Costs

On the cost side, student costs consist of the tuition paid by the students (32.9% of the total in **Table 2.1**) and, most importantly, the opportunity cost of time (the earnings foregone). Also included here are the other sources of institutional revenues (14.1%).[25] The taxpayer costs consist of the state and local tax items in **Table 2.1**, or a total of 27.3% plus 25.7% = 53.0%.

The opportunity cost (earnings foregone) incurred by the student body in the aggregate is estimated in **Table 3.5**. The first number in the table is the overall average statistical annual income of the student body (given gender and ethnicity characteristics). This number, however, reflects the midpoint of the lifetime trajectory of earnings, while what *is* needed is the earnings of the students while enrolled (which is expected to be less than earnings at the midpoint). This is the second number in the table, or $21,381 per year, assuming full-time employment. The adjustment from the first to the second number takes into account the average age of the student body and the relationship between earnings and age as specified by the well-known and tested "Mincer equation" (see, for example, Willis 1986, p 530).

We then deduct the retired student body (1.3%) to arrive at the net number of students subject to opportunity cost calculations -- 284,203 students. The 55,597 not working are charged the full opportunity cost of time (based on the average term in attendance), or $391.8 million. The 228,605 working students are charged only a fraction of the full opportunity cost, or $489.9 million as indicated in the table. Finally, we adjust the opportunity cost downward by the Pell and other student aid grants and the estimated 60% adjustment for the restricted use of these grants for tuition and fees.

[25] The "other sources of institutional revenues" are included only for the sake of completeness -- they do not have any analytical significance in the model.

Table 3.5. Opportunity Costs (Earnings Foregone), $ per Year

			Opp. Cost
Average statistical annual income of given gender and ethnicity profile		$35,076	
Annual income, given gender and ethnicity profile, at current age of students		$21,381	
CHEs per student (net of retired)	9.9		
% of full year in attendance and earnings foregone while attending	33%	$7,048	
Total number of students		288,067	
Less retired students, %	1.3%	3,864	
Remaining students subject to opportunity cost computation		284,203	
Students not working while attending college and opportunity cost	20%	55,597	$391,822,860
Number of working students		228,605	
Earnings relative to statistical averages (%) and opportunity cost	70%	$2,143	$489,884,708
Total opportunity cost			$881,707,568
Pell and other student aid		$98,845,003	
Restricted portion of student aid (tuition and fees)	60%	$59,307,002	($39,538,001)
GRAND TOTAL STUDENT OPPORTUNITY COST			$842,169,567

We also present the results in different ways. First, the student perspective results indicate whether the education obtained at the New Jersey community colleges pays by comparing the private benefits (higher earnings) to the private costs. Second (as discussed in the previous chapter), we compare *all* private and public benefits to the public costs (the state and local taxpayer contributions in **Table 2.1**) in a **broad taxpayer perspective** in present value terms. Third and finally, in a **narrow taxpayer perspective**, we compare only a portion of the public benefits (taxpayer actual savings) to the public costs; i.e., do state and local taxpayer investments of $418.2 million (**Table 2.1**) pay off in terms of the public savings generated?

The Student Perspective

The collective investment of the students (time and money) is assessed in **Table 3.6.** Column 1 tracks the increased earnings of the student body as they leave the colleges, and follows them over the course of their assumed working lives (65 - 28.5 = 37 years, see **Table 2.4**). The upward trend in earnings mimics the Mincer equation (see Willis, 1986). It reflects both the growth in students' earnings over time and the spread in the increased earnings attributable to education.[26] Column 2 is simply Column 1 reduced by the 10% discount value that accounts for causation factors affecting student earnings. Column 3 shows the cost of the single year's education. Finally, Column 4 looks at the educational investment from a cash flow perspective, subtracting annual costs from the annual benefits.

[26] We computed a Mincer equation based on the estimated coefficients presented in Willis, 1986, p. 545. These were adjusted to current year dollars in the usual fashion by applying the "GDP Implicit Price Deflator."

Table 3.6. Student Earnings ($ Thousands)

	1	2	3	4
Year	Higher Earnings Gross	Higher Earnings Net	Cost	Net Cash Flow
1	$109,504	$98,554	$1,206,251	($1,107,697)
2	$132,139	$118,926	$0	$118,926
3	$239,731	$215,758	$0	$215,758
4	$263,776	$237,399	$0	$237,399
5	$289,026	$260,123	$0	$260,123
6	$315,419	$283,877	$0	$283,877
7	$342,883	$308,595	$0	$308,595
8	$371,329	$334,196	$0	$334,196
9	$400,655	$360,590	$0	$360,590
10	$430,746	$387,671	$0	$387,671
11	$461,471	$415,324	$0	$415,324
12	$492,691	$443,422	$0	$443,422
13	$524,250	$471,825	$0	$471,825
14	$555,985	$500,387	$0	$500,387
15	$587,723	$528,951	$0	$528,951
16	$619,283	$557,355	$0	$557,355
17	$650,479	$585,431	$0	$585,431
18	$681,118	$613,006	$0	$613,006
19	$711,007	$639,906	$0	$639,906
20	$739,952	$665,957	$0	$665,957
21	$767,762	$690,986	$0	$690,986
22	$794,248	$714,823	$0	$714,823
23	$819,227	$737,304	$0	$737,304
24	$842,526	$758,273	$0	$758,273
25	$863,980	$777,582	$0	$777,582
26	$883,438	$795,094	$0	$795,094
27	$893,580	$804,222	$0	$804,222
28	$908,726	$817,854	$0	$817,854
29	$921,528	$829,375	$0	$829,375
30	$931,895	$838,706	$0	$838,706
31	$939,760	$845,784	$0	$845,784
32	$945,071	$850,564	$0	$850,564
33	$947,800	$853,020	$0	$853,020
34	$899,902	$809,912	$0	$809,912
35	$778,657	$700,792	$0	$700,792
36	$547,437	$492,694	$0	$492,694
0	$299,810	$269,829	$0	$269,829
0	$234,319	$210,887	$0	$210,887
0	$82,949	$74,654	$0	$74,654
NPV		$9,172,182	$1,159,857	$8,012,325
IRR				24.8%
B/C ratio				7.9
Payback (years)				6.0

Does attending New Jersey's 19 community colleges make economic sense for the students? The answer is a resounding **yes**. The future stream of benefits (higher earnings) accruing to the students has an NPV of $8.0 billion **(Table 3.6)**—a positive NPV (greater than zero) indicates that the investments made are strongly feasible. The B/C ratio of 7.9 is strongly positive since the ratio is well above 1. The RR of 24.8% is also well above the long-term rates of return obtainable in the stock or bond markets, and certainly above the 4.0% discount rate used in the analysis. In the long run, therefore, the average student will be substantially better off attending a community

college. The payback period for a student (tuition plus the earnings foregone) is 6.0 years – the higher earnings received beyond that period are pure economic rent – or a persistent earnings flow over and beyond the initial investments.

The Broad Taxpayer Perspective

Table 3.7 assesses one year's operation of the CCs from the broad taxpayer perspective.[27] The Legislature and county officials, on behalf of taxpayers, must weigh requests for funding against the myriad other public needs. As such, they need information to better allocate increasingly scarce resources between alternative and competing ends. Column 1 shows the stream of total benefits, including increased earnings, and social savings from reduced spending on incarceration, health, welfare and unemployment. Specifics on the estimation of values in Column 1 are presented in **Volume 2: Detailed Results, Table 19**. Column 2 adjusts for the 15% alternative education opportunity assumption (the percentage of the student body able to avail themselves of similar education elsewhere, absent the New Jersey community colleges). Column 3 conveys an adjustment needed to account for the fact that some of the CCs might be able to operate at some level of enrollment absent state and local government support, i.e., by raising tuition (see **Appendix 3** for technical details). Column 4 is simply Column 1 less Column 2 and Column 3. Column 5 shows the state and local taxpayer cost for a single year, as reflected in state and local tax items in **Table 2.1**. Finally, Column 6 considers the broad perspective on the taxpayer's investment in a cash flow sense, subtracting annual costs from annual benefits.

The NPV given this broad perspective is $7.0 billion and the B/C ratio is 18.4. **More succinctly, every dollar of tax monies spent on community college education will generate a total of $18.36 worth of social benefits.**[28]

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[27] Both the broad and narrow taxpayer perspectives use the state, not the local region, as the accounting stance. Thus, we combine state appropriations and the local taxes (see **Table 2.1**) into the estimate of the taxpayers' investment in the colleges.

[28] A word of caution – the RR approach sometimes generates percentage results that defy the imagination. Technically, the approach requires at least one negative cash flow (tuition plus opportunity cost of time) to offset all subsequent positive flows. A very high percentage return may be technically correct, but perhaps not consistent with conventional understanding of returns expressed as percentages. For purposes of the reports prepared for all colleges in the statewide system, therefore, we express all RR results as: "NA" (particularly for the broad taxpayer perspective where high returns are expected). Only the B/C ratio is reported for the broad taxpayer perspective.

Table 3.7: Taxpayer Perspective: Broad ($ Thousands)

Year	1 All Benefits	2 Benefits from All Ec. Opportunities	3 Benefits w/o State & Local Gov Funding	4 Net Benefits	5 Total Taxpayer Costs	6 Less College Income Cash Flow
1	$835,835	$19,677	$0	$816,159	$418,206	$397,953
2	$151,040	$21,876	$0	$129,164	$0	$129,164
3	$224,150	$32,990	$0	$191,160	$0	$191,160
4	$240,016	$35,332	$0	$204,685	$0	$204,685
5	$256,650	$37,787	$0	$218,864	$0	$218,864
6	$274,008	$40,348	$0	$233,660	$0	$233,660
7	$292,035	$43,008	$0	$249,027	$0	$249,027
8	$310,668	$45,757	$0	$264,911	$0	$264,911
9	$329,835	$48,584	$0	$281,251	$0	$281,251
10	$349,455	$51,478	$0	$297,976	$0	$297,976
11	$369,437	$54,425	$0	$315,012	$0	$315,012
12	$389,685	$57,411	$0	$332,273	$0	$332,273
13	$410,093	$60,420	$0	$349,672	$0	$349,672
14	$430,550	$63,436	$0	$367,114	$0	$367,114
15	$450,940	$66,442	$0	$384,498	$0	$384,498
16	$471,141	$69,419	$0	$401,722	$0	$401,722
17	$491,030	$72,349	$0	$418,681	$0	$418,681
18	$510,480	$75,215	$0	$435,265	$0	$435,265
19	$529,364	$77,996	$0	$451,368	$0	$451,368
20	$547,556	$80,675	$0	$466,881	$0	$466,881
21	$564,932	$83,233	$0	$481,699	$0	$481,699
22	$581,370	$85,653	$0	$495,717	$0	$495,717
23	$596,755	$87,916	$0	$508,839	$0	$508,839
24	$610,976	$90,008	$0	$520,969	$0	$520,969
25	$623,932	$91,912	$0	$532,020	$0	$532,020
26	$635,528	$93,616	$0	$541,912	$0	$541,912
27	$640,763	$94,614	$0	$546,149	$0	$546,149
28	$649,459	$95,887	$0	$553,572	$0	$553,572
29	$656,588	$96,927	$0	$559,660	$0	$559,660
30	$662,098	$97,729	$0	$564,369	$0	$564,369
31	$665,954	$98,285	$0	$567,668	$0	$567,668
32	$668,130	$98,594	$0	$569,536	$0	$569,536
33	$668,617	$98,653	$0	$569,964	$0	$569,964
34	$632,043	$91,388	$0	$540,655	$0	$540,655
35	$549,087	$79,270	$0	$469,817	$0	$469,817
36	$385,463	$56,592	$0	$328,872	$0	$328,872
0	$216,039	$31,161	$0	$184,878	$0	$184,878
0	$166,444	$26,150	$0	$140,294	$0	$140,294
0	$57,302	$9,400	$0	$47,902	$0	$47,902
NPV				$7,381,231	$402,121	$6,979,110
IRR						NA
B/C ratio						18.4
Payback (years)						NA

The Narrow Taxpayer Perspective

Table 3.8 provides an investment analysis of the New Jersey community colleges from the narrow taxpayer perspective. Recall from **Chapter 2** that the narrow perspective considers only monies that actually appear on the books of state and local governments: revenue items such as tax receipts, and expenditure items such as road, bridge and street maintenance, police, public libraries and hospitals, jails and prisons, welfare payments, and so on.

Table 3.8, Column 1 shows additions to state and local government revenues stemming from the operation of the New Jersey community colleges during the single analysis

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year. The values in Column 1 are computed by applying average state and local government tax rates to the net increase in statewide income attributed to the New Jersey community college system.[29] Also included in Column 1 are reductions (entered as negatives) in state and local government expenditures on crime, welfare, unemployment, and health. Projected dollar amounts in Column 1 are thus the sum of additional taxes collected, plus associated tax dollars saved as a result of the education provided by the colleges during the single analysis year.

Column 2 reflects the adjustment attributable to the alternative education variable, while Colum 3 reflects the ability of some of the CCs to operate without the current level of state and local government support, as discussed above and in **Appendix 3**. Column 4 shows net benefits, Column 1 minus Columns 2 and 3. Colum 4 shows state and local government costs, taken directly from **Table 2.1**. Finally, Column 6 subtracts state and local government cost from benefits, thereby providing the temporal cash flow needed for the investment analysis. As shown at the bottom of the table, the colleges provide state and local government with an aggregate annual return of $709.0 million expressed as a net present value on its one year investment. Alternatively, the one year investment generates a 13.9% RR and a B/C ratio of 2.8, both indicating that the investment is attractive. The payback period is 9.6 years.

The returns shown in **Table 3.8** would be attractive even in the private sector, and they are very attractive in the public sector. Recall that the public sector generally undertakes those activities the private sector finds unprofitable, i.e., investments that generate book revenues insufficient to cover book costs, thus requiring taxpayer subsidy. For example, state governments fund the operation and maintenance of state parks at a substantial loss, collecting revenues in the form of camping and entrance fees that cover only a fraction of costs. Taxpayers are willing to subsidize parks because they perceive off-budget benefits, e.g., access to the outdoors, state development effects, environmental protection, and so on, that justify the budgetary losses. Note that this broader collection of off-budget benefits would normally be captured in the broad taxpayer perspective.

[29] Increased income includes a portion of direct student earnings, salaries, and wages at the colleges during the single analysis year, and an additional increment aimed at a collection of backward and forward multiplier effects.

Table 3.8. Taxpayer Perspective: Narrow ($ Thousands)

Year	1 Total Taxpayer Benefits	2 Benefits from Alt Ed Opportunities	3 Benefits w/o State & Local Gov Funding	4 Net Taxpayer Benefits	5 Total Taxpayer Costs	6 Net Cash Flow
1	$125,720	$1,751	$0	$123,970	$418,206	($294,236)
2	$22,637	$3,278	$0	$19,359	$0	$19,359
3	$33,645	$4,951	$0	$28,694	$0	$28,694
4	$36,036	$5,304	$0	$30,731	$0	$30,731
5	$38,542	$5,674	$0	$32,868	$0	$32,868
6	$41,157	$6,060	$0	$35,097	$0	$35,097
7	$43,872	$6,461	$0	$37,412	$0	$37,412
8	$46,679	$6,875	$0	$39,805	$0	$39,805
9	$49,566	$7,301	$0	$42,266	$0	$42,266
10	$52,522	$7,736	$0	$44,785	$0	$44,785
11	$55,532	$8,180	$0	$47,351	$0	$47,351
12	$58,582	$8,630	$0	$49,951	$0	$49,951
13	$61,656	$9,083	$0	$52,572	$0	$52,572
14	$64,737	$9,538	$0	$55,199	$0	$55,199
15	$67,808	$9,990	$0	$57,818	$0	$57,818
16	$70,851	$10,439	$0	$60,412	$0	$60,412
17	$73,847	$10,880	$0	$62,967	$0	$62,967
18	$76,776	$11,312	$0	$65,465	$0	$65,465
19	$79,621	$11,731	$0	$67,890	$0	$67,890
20	$82,361	$12,134	$0	$70,227	$0	$70,227
21	$84,978	$12,520	$0	$72,459	$0	$72,459
22	$87,454	$12,884	$0	$74,570	$0	$74,570
23	$89,772	$13,225	$0	$76,547	$0	$76,547
24	$91,914	$13,540	$0	$78,374	$0	$78,374
25	$93,866	$13,827	$0	$80,039	$0	$80,039
26	$95,613	$14,084	$0	$81,530	$0	$81,530
27	$96,412	$14,235	$0	$82,177	$0	$82,177
28	$97,723	$14,427	$0	$83,296	$0	$83,296
29	$98,797	$14,584	$0	$84,213	$0	$84,213
30	$99,628	$14,705	$0	$84,924	$0	$84,924
31	$100,210	$14,789	$0	$85,421	$0	$85,421
32	$100,539	$14,835	$0	$85,704	$0	$85,704
33	$100,614	$14,844	$0	$85,769	$0	$85,769
34	$95,145	$13,758	$0	$81,387	$0	$81,387
35	$82,654	$11,934	$0	$70,720	$0	$70,720
36	$58,056	$8,527	$0	$49,529	$0	$49,529
0	$32,607	$4,707	$0	$27,901	$0	$27,901
0	$25,155	$3,954	$0	$21,201	$0	$21,201
0	$8,633	$1,418	$0	$7,215	$0	$7,215
NPV				$1,111,147	$402,121	$709,026
IRR						13.9%
B/C ratio						2.8
Payback (years)						9.6

Investments in public education are usually viewed in the same way as investments in parks and other publicly subsidized activities, i.e., activities that generate losses from a narrow investment perspective but are justified by net benefits from a broad investment perspective. As shown in **Table 3.8,** however, the 19 New Jersey CCs are a notable exception to this general net-subsidy rule. The narrow perspective rate of return is strongly positive, and thereby indicates that the taxpayers' investments in the colleges generate increased public revenues and reduced expenditures that actually exceed the subsidy by taxpayers. **The practical effect of this is the following: if the investments**

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made in the New Jersey community colleges were reduced, taxes would have to be raised in order for state and local governments to continue their support of other activities at current levels. The taxpayer investments of 53% of the total revenues (Table 2.1), in effect, subsidize other sectors of the economy that also receive taxpayer support. The simple bottom line from the narrow taxpayer perspective is that benefits accruing to the taxpayers far outweigh the relatively low investments they make in the colleges.

With and Without Social Benefits

In **Chapter 2** the social benefits attributable to CC education (reduced crime, welfare and unemployment, and improved health) were defined as *external benefits*, incidental to the operations of the colleges. Colleges do not directly aim at creating these benefits. Some would question the legitimacy of including these benefits in the calculation of the rates of return to higher education, arguing that only the direct benefits – the higher earnings – should be counted. **Tables 3.7** and **3.8** are both inclusive of the social benefits reported here as attributable to the colleges. Recognizing the other point of view, **Table 3.9** shows the rates of return for both the broad and narrow perspectives exclusive of the social benefits. As indicated, the returns are still well above the threshold values (a B/C ratio greater than 1) confirming that the taxpayers receive great value from investing in New Jersey's CCs.

Table 3.9. Taxpayer Perspective ($ Thousands)

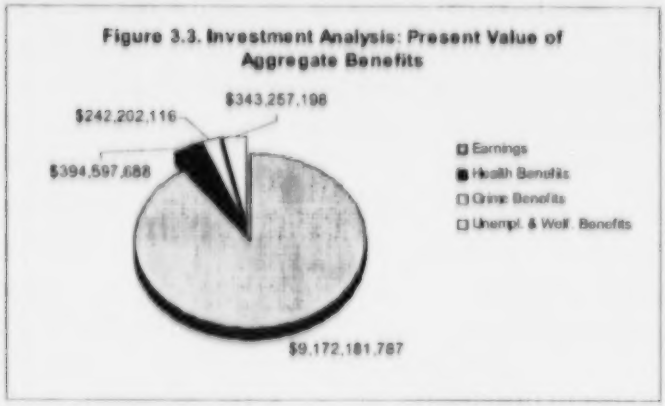
	Broad Perspective With Social Savings		Narrow Perspective With Social Savings	
	Included	Excluded	Included	Excluded
NPV	$6,979,110	$6,100,573	$709,026	$576,758
IRR	NA	NA	13.9%	11.8%
B/C ratio	18.4	16.2	2.8	2.4
Payback (years)	NA	NA	9.6	11.3

Summary

A summary of the investment analysis results (also reported in **Tables 3.6 – 3.8** above) is provided in **Table 3.10,** on aggregate, per CHE, and per student bases. The pie chart in **Figure 3.3** shows the breakdown of the present values of the aggregate benefits, taken from **Table 3.10**. **Figure 3.4** shows the breakdown of the investments made by the students (tuition and fees plus opportunity cost of time) and the contribution made by the state through local taxes and appropriations (see "PV of all costs" in **Table 3.10**).

Table 3.10. Summary of Investment Analysis Results

	Aggregate	Per Credit	Per Student
PV of student benefits, increased earnings	$ 9,172,161,787	$3,243	$ 32,273
Health benefits, captured by society			-
PV of absenteeism savings	$ 174,780,507	$62	$ 615
PV of tobacco and alcohol abuse medical savings	$ 219,817,182	$78	$ 773
Crime			-
PV of reduced incarceration	$ 92,064,333	$33	$ 324
PV of reduced victim costs	$ 101,395,065	$36	$ 357
PV of earnings (opportunity gained)	$ 48,742,717	$17	$ 172
Unemployment and welfare			-
PV of reduced welfare rolls	$ 202,374,187	$72	$ 712
PV of reduced unemployment	$ 140,883,011	$50	$ 496
Sum of all present values, benefits	$ 10,152,238,789	$ 3,589	$ 35,722
PV of all costs			
PV of state and local contribution to college budget	$ 418,205,896	$148	$ 1,472
PV of opportunity cost of education plus tuition	$ 1,206,251,000	$426	$ 4,244
Sum of all present values, costs	$ 1,624,456,896	$ 574	$ 5,716
NPV, Student Perspective ($ Thousands)		$8,012,325	
RR, Student Perspective		24.8%	
B/C Ratio, Student Perspective		7.9	
Payback Period, Student Perspective		6.0	
NPV, Taxpayer Perspective: Broad ($ Thousands)		$6,979,110	
RR, Taxpayer Perspective: Broad		NA	
B/C Ratio, Taxpayer Perspective: Broad		18.4	
Payback Period, Taxpayer Perspective: Broad		NA	
NPV, Taxpayer Perspective: Narrow ($ Thousands)		$709,026	
RR, Taxpayer Perspective: Narrow		13.9%	
B/C Ratio, Taxpayer Perspective: Narrow		2.8	
Payback Period, Taxpayer Perspective: Narrow		9.6	



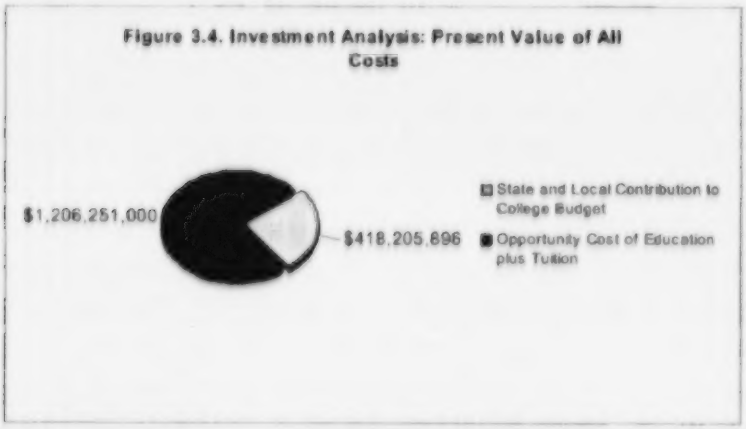


Figure 3.4. Investment Analysis: Present Value of All Costs
$1,206,251,000
$418,205,696
State and Local Contribution to College Budget
Opportunity Cost of Education plus Tuition

STATEWIDE ECONOMIC BENEFITS

New Jersey's 19 community colleges play an important role in the resiliency, growth, and development of the state economy. In 2002, the State of New Jersey generated overall earnings (wages, salaries, and proprietors' income) equal to $227.7 billion.[10] The portion of this total credited to the existence of the 19 New Jersey CCs is discussed in the four subsections below, both in the aggregate and with industry detail. The industry-

[10] Total earnings for the State of New Jersey are obtained from Woods & Poole Economics, Inc. (see www.woodsandpoole.com). Woods & Poole Economics, Inc. specializes in county-level economic and demographic projections. Their earnings estimates are based on estimates published by the US Department of Commerce, Regional Economic Information System (REIS), projected forward on the basis of historic trends.

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specific analysis highlights the contribution of New Jersey CCs to the statewide business community.

We begin with the day-to-day operating and capital expenditures of the colleges. These are fed into the regional IO model to estimate the earnings impacts generated by industry. Next, we consider the value of workforce-embodied CHEs to the earnings of past students, and then estimate the net portion that can be counted as increased regional income – the *direct impact* of past New Jersey CC instruction. In the third section we utilize the multipliers of the regional IO model and estimate the *indirect impact* of past New Jersey CC instruction on statewide earnings. In the fourth and final subsection we combine the three separate effects: 1) CC operations and capital spending effects, 2) past student direct effects, and 3) past student indirect effects, to arrive at the overall aggregate effect of New Jersey's CCs on earnings in the State of New Jersey.

Earnings Linked to Operation and Capital Spending

Table 2.10 in **Chapter 2** shows the 19 New Jersey community colleges' operating and capital spending during the analysis year. The last column (Column 6) of that table shows how much of the overall spending is captured by state vendors and other suppliers, i.e., the portion that stays in the state economy. The values in Column 6 are applied to the State of New Jersey IO model to estimate the associated multiplier effects.

Table 3.11 shows the results of the IO multiplier analysis of New Jersey's CC operating and capital spending. Column 1 is for reference, showing 2002 total earnings by industry. Column 2 shows the portion of total earnings explained by (or accounted for by) the spending of New Jersey's CCs, and Column 3 shows college-linked earnings as a percentage of total earnings by industry. For example, the construction sector in the State of New Jersey had $10.1 billion in total earnings in 2002. Of this, New Jersey's CCs' spending accounts for $27.8 million (or 0.3%). Similarly, the business-services sector (services to buildings, advertising, reproduction, legal and accounting services, etc.) had $35.4 billion in total earnings in 2002, of which $49.1 million (or 0.1%) was explained by the spending of New Jersey's CCs. All told, New Jersey's CCs' spending explained $685.3 million, or 0.3% of all statewide earnings in 2002.

Table 3.11. Earnings Linked to New Jersey's CCs Operations Expenditures

	Earnings		
	Baseline	College-Linked	% College-Linked
	($1,000)		
Industries	1	2	3
Agriculture and Agricultural Services	$1,291,596	$579	0.0%
Mining, Sand, and Gravel	$305,501	$39	0.0%
Construction	$10,114,737	$27,844	0.3%
Manufacturing: Food, Wood, Paper, and Textiles	$5,429,750	$5,262	0.1%
Manufacturing: Chemicals, Petroleum, Stone, and Glass	$19,510,074	$10,129	0.1%
Manufacturing: Computer and Electronic Equipment	$1,782,437	$587	0.0%
Manufacturing: Other	$3,889,944	$2,342	0.1%
Transportation	$7,483,057	$6,553	0.1%
Public Utilities	$2,061,876	$6,093	0.3%
Publishing and Communications	$10,319,871	$5,423	0.1%
Trade	$36,641,087	$37,750	0.1%
Finance, Insurance, and Real Estate	$22,878,901	$24,027	0.1%
Motels, Eating/Drinking, and Amusement/Recreation	$8,380,854	$11,445	0.1%
Consumer Services	$6,467,544	$9,206	0.1%
Business Services	$35,420,025	$49,092	0.1%
Medical, Educational, and Social Services	$24,077,277	$43,952	0.2%
Federal Government	$5,693,880	$4,258	0.1%
State and Local Government (less the college)	$25,484,785	$4,457	0.0%
New Jersey's CCs	$436,313	$436,313	100.0%
Total	$227,669,507	$685,349	0.3%

Past Student Economic Development Effects: The Direct Effect

Switching now to the past students, the objective is to assign value to the embodied CHEs still operative in the statewide workforce. These skills increase the productivity of the statewide workforce: existing industry becomes more efficient, competitive, and able to expand product lines. Also, new industry can be attracted to the state. The net effect is an enlargement of the statewide income, whether existing industry expands or new industry is created.

In **Table 2.13** we derived an estimate of 55.0 million of past CHEs embodied in the present-day statewide workforce. In **Table 3.12**, we detail the steps that take us from CHEs embodied in the workforce to an estimate of the *net* impact of New Jersey's CCs' instruction on statewide earnings:

- Step 1: We show the 55.0 million of past CHEs embodied in the current workforce.

- Step 2: As shown earlier in this chapter (**Table 3.3**), the average net value for earnings was reported as $155. The net value was derived as the gross value less

10%.[31] For the statewide economic development effect, however, we need to begin with the *gross* value per CHE, or $172.

- Step 3: The product of the total embodied CHEs and the gross value per CHE comprises the initial estimate of the aggregate addition of New Jersey's CCs' instruction to past student earnings.

- Step 4: In **Chapter 2**, **Table 2.9** we described the source and meaning of the "alternative education opportunity variable." Absent New Jersey's CCs, 14.7% of the students would still be able to obtain their education elsewhere. This portion of the added earnings is not credited to New Jersey's CCs in the calculation of statewide growth effects for reasons stated in the previous chapter. The initial estimate of the aggregate addition to past student earnings, therefore, is restated as the net of the alternative education opportunity, indicated in **Table 3.12**.

- Step 5: Finally, the last adjustment reduces the earnings of past students to all but 33% of the previous number. As discussed in detail in **Chapter 2** (see text box on polar cases), the reasons for the significant discounting of past student earnings pertains largely to issues of worker substitution, i.e., the substitution of state skilled for state unskilled workers, and the substitution of out-of-state workers for in-state workers. As for the specific 33% value, this is borrowed from the economics literature on national income growth and education (see: Bils and Klenow, 2000).

Table 3.12. Estimating the Net Statewide Income Effect of Embodied CHEs

	Variables
Total embodied CHEs	55,014,586
Gross value per CHE	$172
Increased earnings of past students	$9,437,248,809
Alternative education variable, %	15%
Gross earnings attributable to New Jersey's CCs, net of alternative education variable	$8,048,176,234
Substitution Effects Rate	33%
Net earnings attributable to New Jersey's CCs	$2,655,898,157

[31] **Table 3.3** assigns a $155 net value per CHE of New Jersey's CCs' instruction. This is a net value reflecting a 10% reduction from the gross value to account for a collection of correlation-causation factors as discussed in **Chapter 2** under the section "Annual Private Benefits." Rather than *personal* income effects, however, the present section looks at *regional* income effects. Estimating the latter entails an entirely different set of correlation-causation adjustments; hence, we start again with the gross value.

As shown in the last entry of **Table 3.12**, our analysis concludes that earnings in the State of New Jersey are $2.7 billion larger than they would be otherwise, because of the skills of past students embodied in the present-day workforce.

The statewide business community is naturally interested in how the 19 New Jersey CCs affect its operations. This is shown in **Table 3.13**. Beginning with Column 4 in **Table 2.13**, the distribution of historic past student CHEs by industrial sector is translated in **Table 3.13** into the increase in aggregate earnings across these same industrial sectors. The distribution of aggregate earnings is based on the distribution of past student CHEs (**Table 2.13**, Column 4), weighted according to relative industry earnings.

The dollar figures shown in Column 2 of **Table 3.13** indicate how much larger the earnings in these industries are as a direct result of the New Jersey CC skilled workers they employ. The Manufacturing: Computer and Electronic Equipment sector, for example, is estimated to employ New Jersey CC students with a combined 672,023 hours of CHEs (see **Table 2.13**). Because of the skills of these past students, the Manufacturing: Computer and Electronic Equipment sector is estimated to generate earnings that are $36.3 million (or 2.0%) larger than they would be otherwise. The benefit to the business community is simply this: additional earnings mirror additional business volume, sales revenues, and property incomes. The direct effect of past students on other sectors is shown in the table. The statewide direct effect of past student skills are shown in the bottom row of **Table 3.13**: overall regional earnings are $2.66 billion (or 1.2%) higher than they would be if the 19 New Jersey community colleges did not exist.

Earnings are larger because outputs are larger, existing industries produce more, and new industries are attracted to the state by the existence of a skilled workforce. The earnings effects shown in **Table 3.13** are called *direct effects*, because they reflect a portion of the increased earnings of past students themselves.

Table 3.13. Past Student Direct Effects

	Earnings		
	Baseline	College-Linked	% College Linked
	($1,000)		
Industries	1	2	3
Agriculture and Agricultural Services	$1,291,596	$1,315	0.1%
Mining, Sand, and Gravel	$305,501	$311	0.1%
Construction	$10,114,737	$10,299	0.1%
Manufacturing: Food, Wood, Paper, and Textiles	$5,429,750	$27,643	0.5%
Manufacturing: Chemicals, Petroleum, Stone, and Glass	$19,510,074	$198,654	1.0%
Manufacturing: Computer and Electronic Equipment	$1,782,437	$36,298	2.0%
Manufacturing: Other	$3,889,944	$39,608	1.0%
Transportation	$7,483,057	$38,097	0.5%
Public Utilities	$2,061,876	$10,497	0.5%
Publishing and Communications	$10,319,871	$210,156	2.0%
Trade	$36,641,087	$373,084	1.0%
Finance, Insurance, and Real Estate	$22,878,901	$465,911	2.0%
Motels, Eating/Drinking, and Amusement/Recreation	$8,380,854	$42,667	0.5%
Consumer Services	$6,467,544	$32,927	0.5%
Business Services	$35,420,025	$360,651	1.0%
Medical, Educational, and Social Services	$24,077,277	$490,315	2.0%
Federal Government	$5,693,880	$57,976	1.0%
State and Local Government	$25,921,097	$259,489	1.0%
Total	$227,669,507	$2,655,898	1.2%

Past Student Economic Development Effects: The Indirect Effect

To the direct effects shown in **Table 3.13**, we must now add *indirect effects* stemming from the action of the regional multiplier process. As earnings increase because of higher industry output, the demand for additional industry inputs increases as well. Moreover, with the higher *direct* earnings (shown in **Table 3.13**), workers have more money to spend, which increases sales in consumer-oriented sectors of the economy. On top of these added business inputs and worker expenditures, the action of the state multiplier generates still further rounds of industry output and earnings.[32]

There is another part to the indirect effect. Economic development theory describes an *agglomeration effect* whereby regional growth itself stimulates growth (see "The Indirect Economic Development Effects of Students" discussion in **Chapter 2**). In general, agglomeration occurs when additional state output attracts new industry, facilitates

[32] The multiplier effects described in this paragraph are traditional "backward" multiplier effects, and are estimated by applying the change in sectoral earnings shown in **Table 3.13** to the State of New Jersey IO model.

economies of scale, enhances workforce efficiency through information sharing, and otherwise enhances the statewide business climate.[33]

Table 3.14 shows the total of the various indirect effects that accompany the direct effects of **Table 3.13**. These effects reflect increased business outputs independent of the actual employment of past students in particular sectors: i.e., they reflect the action of the multiplier process.

Table 3.14. Past Student Indirect Effects

	Earnings		
Industries	Baseline ($1,000)	College-Linked ($1,000)	% College-Linked
Agriculture and Agricultural Services	$1,291,596	$11,553	0.9%
Mining, Sand, and Gravel	$305,501	$1,522	0.5%
Construction	$10,114,737	$142,433	1.4%
Manufacturing: Food, Wood, Paper, and Textiles	$5,429,750	$65,418	1.2%
Manufacturing: Chemicals, Petroleum, Stone, and Glass	$19,510,074	$200,163	1.0%
Manufacturing: Computer and Electronic Equipment	$1,782,437	$21,086	1.2%
Manufacturing: Other	$3,889,944	$36,098	0.9%
Transportation	$7,483,057	$104,134	1.4%
Public Utilities	$2,061,876	$29,110	1.4%
Publishing and Communications	$10,319,871	$106,344	1.0%
Trade	$36,641,087	$450,026	1.2%
Finance, Insurance, and Real Estate	$22,878,901	$279,287	1.2%
Motels, Eating/Drinking, and Amusement/Recreation	$8,360,854	$140,899	1.7%
Consumer Services	$6,467,544	$127,737	2.0%
Business Services	$35,420,025	$595,129	1.7%
Medical, Educational, and Social Services	$24,077,277	$465,833	1.9%
Federal Government	$5,693,880	$66,501	1.2%
State and Local Government	$25,921,097	$158,583	0.6%
Total	$227,669,507	$3,001,857	1.3%

Focusing on particular effects, we can now say that because of the indirect effect of past students, earnings in the Consumer Services sector will be $127.7 million (or 2.0%) higher than would otherwise be the case. Other indirect sectoral effects are as shown in the table. The bottom row of **Table 3.14** indicates that region-wide total earnings are $227.7 billion, of which $3.0 billion (or 1.3%) are due to the indirect effect of past students.

[33] We estimate agglomeration effects as "forward" multiplier effects. The State of New Jersey IO model is configured to provide a set of so-called supply-driven multipliers (see for example Miller and Blair, 1985). Agglomeration effects are obtained by applying the change in higher stage sectoral earnings from **Table 3.13** to the supply-driven form of the State of New Jersey IO model.

Overall Effect of New Jersey's Community Colleges on the Statewide Economy

The tables above detail the regional economic effects attributable to New Jersey's CCs in three parts. The effect of day-to-day college operations and capital spending is shown in **Table 3.11**. The direct effect of past students still active in the workforce is shown in **Table 3.13**. Finally, the indirect effect of past students still active in the workforce is shown in **Table 3.14**. **Table 3.15** combines these separate effects into one summary table.

Table 3.15. Total Effect

	Earnings		
Industries	Baseline	College-Linked ($1,000)	% College-Linked
Agriculture and Agricultural Services	$1,291,596	$13,447	1.0%
Mining, Sand, and Gravel	$305,501	$1,872	0.6%
Construction	$10,114,737	$180,576	1.8%
Manufacturing: Food,Wood, Paper, and Textiles	$5,429,750	$98,324	1.8%
Manufacturing: Chemicals, Petroleum, Stone, and Glas:	$19,510,074	$408,946	2.1%
Manufacturing: Computer and Electronic Equipment	$1,782,437	$57,971	3.3%
Manufacturing: Other	$3,889,944	$78,048	2.0%
Transportation	$7,483,057	$148,784	2.0%
Public Utilities	$2,061,876	$45,700	2.2%
Publishing and Communications	$10,319,871	$321,923	3.1%
Trade	$36,641,087	$860,859	2.3%
Finance, Insurance, and Real Estate	$22,878,901	$769,225	3.4%
Motels, Eating/Drinking, and Amusement/Recreation	$8,380,854	$195,012	2.3%
Consumer Services	$6,467,544	$169,870	2.6%
Business Services	$35,420,025	$1,004,872	2.8%
Medical, Educational, and Social Services	$24,077,277	$1,000,100	4.2%
Federal Government	$5,693,880	$128,734	2.3%
State and Local Government (less the college)	$25,484,785	$422,529	1.7%
New Jersey's CCs	$436,313	$436,313	100.0%
Total	$227,669,507	$6,343,104	2.8%

Individual rows in **Table 3.15** show how particular industries benefit from the past and present existence of the 19 New Jersey CCs. For example, our analysis suggests the State of New Jersey's Medical, Educational, and Social Services sector owes $1.0 billion (or 4.2%) of its overall earnings to the past and present existence of New Jersey's CCs. The effect of New Jersey's CCs on other industries is shown in the table. The bottom row of **Table 3.15** indicates that region-wide earnings are $227.7 billion, of which $6.3 billion (or 2.8%) are due to the past and present existence of the 19 New Jersey community colleges.

Table 3.16. Summary of CCs' Role in the State Economy

	Earnings ($Thousands)	% of Total
Total Earnings in State	$227,669,507	100%
Earnings Attributable to College Operations		
Direct Earnings of Faculty and Staff	$436,313	0.2%
Indirect Earnings	$249,036	0.1%
TOTAL	$685,349	0.3%
Earnings Attributable to Past Student Econ. Dev. Effects		
Direct Earnings	$2,655,898	1.2%
Indirect Earnings	$3,001,857	1.3%
TOTAL	$5,657,755	2.5%
GRAND TOTAL	$6,343,104	2.8%

Table 3.16 provides one last view of the regional economic effects of New Jersey's CCs, a fully aggregated view with no industry detail. Consider the items under the heading "Earnings Attributable to College Operations." The first item is simply the wages and salaries of the faculty and staff of the 19 New Jersey CCs, $436.3 million, or 0.2% of overall statewide earnings (this item is also shown in college spending, **Table 2.10**). The second item shows the indirect effect of the colleges' operations and capital spending: $249.0 million, or 0.1% of all statewide earnings. All told, the operations and capital spending of the 19 New Jersey CCs can be credited with $685.3 million, or 0.3% of the State of New Jersey's $227.7 billion in overall earnings.

The next set of items detail the effect of past students still active in the State of New Jersey workforce. Past students directly explain $2.7 billion, or 1.2% of all statewide earnings (shown on the total row of **Table 3.13**). These same students indirectly explain $3.0 billion, or 1.3% of all statewide earnings (shown on the total row of **Table 3.14**). In all, past students still active in the workforce can be credited with $5.7 billion, or 2.5% of all earnings in the State of New Jersey.

Finally, the bottom row of **Table 3.16** shows the overall role of New Jersey's CCs in the state's economy: $6.3 billion, or 2.8% of all statewide earnings.

Chapter 4
SENSITIVITY ANALYSIS OF KEY VARIABLES

INTRODUCTION

We conclude this study with a sensitivity analysis of some key variables on both the investment and regional economic development sides. The purpose of the sensitivity analysis is twofold:

1. *To set our approach apart from "advocacy" education impact analyses.* Many of these may lack uniformity and use assumptions that will not stand up to rigorous peer scrutiny, and they often generate results that grossly overstate benefits. The approach taken here is to account for all relevant variables on both the benefit and cost sides as reflected in the conservatively estimated base case assumptions laid out in **Chapter 2**. The sensitivity tests include: a) the impacts associated with changes in the student employment variables for the investment analysis, and b) the addition of student spending and sales (as opposed to earnings only) to the regional economic development analysis.

2. *To test the sensitivity of the results associated with the assumptions for which college researchers have applied judgment and innovative thinking rather than hard data to estimate the numbers.* Some may even refer to these variables as educated guesswork. They include the "Alternative Education" and "Attrition Rate" variables discussed in **Chapter 2**.

THE STUDENT EMPLOYMENT VARIABLES

Probably the most difficult data to collect are for the two employment variables (because colleges generally do not collect this kind of information as a matter of formal routine): 1) the percent of the students employed, and 2) of those employed, the earnings received by the students relative to the full earnings they would have received if not attending New Jersey's CCs. Both employment variables relate to the earnings foregone by the students – the opportunity cost of time – and they affect the investment analysis results (NPV, RR, B/C, and payback period).

Percent of Students Employed

The students incur substantial expense by attending New Jersey's CCs because of the time they spend not gainfully employed. Some of that cost is recaptured if the student remains partially (or fully) employed while attending. It is estimated that 80% of the current student body is employed. We test this variable in the sensitivity analysis by changing this assumption to 100%. This change would mean that *all* of the students are employed, reducing the average opportunity cost of time accordingly.

Percent of Earnings Relative to Full Earnings

The second opportunity cost variable is more difficult to estimate. On average for all 19 colleges, it is estimated that the students working while attending classes earn only 70%, on average, of the earnings they would have statistically received if not attending the CC. This suggests that many of the students hold part-time jobs earning minimum wage (or less than their "statistical" wages). The model captures these differences and counts them as a part of the opportunity cost of time. As above, we test this variable in the sensitivity analysis by changing the assumption to 100%. This would mean that the students are fully employed, and the average opportunity cost of time would be reduced accordingly.

Results

The changed assumptions (both of which would be consistent with advocacy analyses) generate the results summarized in **Table 4.1**. Here, the base case assumptions taken from **Table 2.2** are reflected in the two shaded rows for the variables tested – 80% for the portion of students employed, and 70% for their earnings relative to the statistical averages. These (base case) assumptions are held constant in the shaded rows for the student perspective. The sensitivity analysis results are shown in the non-shaded rows – the extent to which the investment analysis results would change if the two base case variables were increased to 100%, first separately, and second, together. Changing both assumptions to 100% (all students fully employed) would automatically increase the benefits because the opportunity cost of time would reduce to zero.

1. Increasing the students employed assumption from 80% to 100% first (holding all of the other assumptions constant), the RR, B/C, and payback period results would improve to 30.4%, 10.2, and 5.0 years, respectively, relative to the base case results.

The improved results are attributable to a lower opportunity cost of time – all students would be employed in this case.

2. Increasing the earnings relative to the statistical averages from 70% to 100% second (holding the second employment assumption constant at the base case level), the RR, B/C, and payback period results would improve to 38.0%, 13.3, and 4.2 years, respectively, relative to the base case results – a strong improvement over the base case results, again attributable to a lower opportunity cost of time.

3. Finally, increasing both of the above assumptions to 100% simultaneously, the RR, B/C, and payback period results would improve yet further to 72.8%, 26.2, and 2.7 years, respectively, relative to the base case results. This scenario assumes that all students are fully employed and earning full salaries (equal to the statistical averages) while attending classes. These results are unrealistic, albeit not uncommon for advocacy analyses.

Table 4.1 Sensitivity Analysis of Student Perspective

Variables	Assumptions	RR	B/C	Payback
1. Percent	80%	24.8%	7.9	6.0
Employed	100%	30.4%	10.2	5.0
2. Percent of	70%	24.8%	7.9	6.0
Earnings	100%	38.0%	13.3	4.2
1 = 100%, 2 = 100%		72.8%	26.2	2.7

A final note to this section – we strongly emphasize that the base case results are very attractive – the results are all well above their threshold levels, and the payback periods are short. As clearly demonstrated here, advocacy results *appear* much more attractive, although they would overstate the benefits. The results presented in **Chapter 3** are *realistic*, indicating that investments in New Jersey's CCs will generate excellent returns, well above the long-term average percent rates of return of roughly 7% in the stock and bond markets.

Statewide Economic Development

The economic impacts of higher education can be calculated in different ways. Our approach was to estimate the economic impacts of the 19 community colleges based on college operations and capital spending (**Table 3.16**), and the increased productivity

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effects of past students in the regional workforce. The impacts were expressed in terms of regional *earnings*, i.e., area wages, salaries and proprietors' income, published by the U.S. Department of Commerce.[34] Others often add student spending to the impacts and express the results in terms of sales instead of earnings – both will substantially inflate the numerical measures of the impacts so that they appear larger than they really are. In the present section we address these two issues: 1) the addition of student spending effects to impact estimates, and 2) the expression of economic impacts in terms of regional gross sales rather than earnings.

The Economic Impact of Student Spending

Students spend money while attending college: they buy books and supplies, rent rooms, purchase food, pay for transportation, attend sports events, go to movies, and so on. These expenditures create jobs and incomes for state businesses, which, as argued by some, should be counted among the regional economic impacts attributable to the colleges.

In our analysis, however, we exclude student spending because most of the students already reside in state. Student expenditures, therefore, do not represent new monies in the region, but rather a redirection of monies that would have been spent anyway. The other side of the argument is that, even though the college-related spending of a resident student does not constitute new money, some students would leave the state to obtain an education elsewhere if the colleges were not present. Thus, the state loses the spending and related jobs and incomes. Both cases have merit, although we believe the former is more reasonable than the latter. This is because only a few students will actually be able to avail themselves of an education elsewhere (see **Table 2.9**). Our approach, therefore, is to exclude student spending, recognizing at the same time, that the regional impact estimates may err on the conservative side.

In **Table 4.2** we show the potential magnitude of student spending effects in the state economy. The table parallels **Table 3.16** in the previous chapter, but adds the section "Earnings Attributable to Student Spending,"[35] creating some $314.5 million in

[34] U.S. Department of Commerce, Regional Economic Information System (REIS) data includes earnings estimates for counties and states, and is published annually in the ***Department's Survey of Current Business***. It is also readily available in electronic form.

[35] We estimated student spending effects by borrowing average college student information from a study conducted for higher education economic impacts in Illinois (University of Illinois, 2000). Student

additional earnings for the state businesses patronized by students (the direct effects), plus another $348.3 million in earnings stemming from related multiplier effects (indirect effects). Adding the student spending to the mix increases New Jersey's CCs' total "explanatory power" of the regional earnings from 2.8% in **Table 3.16** to 3.1% in **Table 4.2**.

Table 4.2. Summary of CCs' Role in the State Economy - Earnings

	Earnings ($ Thousands)	% of Total
Total Earnings in State	$227,669,507	100%
Earnings Attributable to Student Spending		
Direct Earnings	$314,542	0.1%
Indirect Earnings	$348,296	0.2%
TOTAL	$662,838	0.3%
Earnings Attributable to College Operations		
Direct Earnings of Faculty and Staff	$436,313	0.2%
Indirect Earnings	$249,036	0.1%
TOTAL	$685,349	0.3%
Earnings Attributable to Past Student Econ. Dev. Effects		
Direct Earnings	$2,655,898	1.2%
Indirect Earnings	$3,001,857	1.3%
TOTAL	$5,657,755	2.5%
GRAND TOTAL	$7,005,942	3.1%

Economic Impacts Reported as Gross Sales

Advocates sometimes favor gross sales over earnings as an impact measure, because sales are always larger than the earnings. Using this as an impact measure has notable drawbacks, however. An immediate drawback is that, unlike earnings, there is generally no published total against which a sales impact can be measured. More importantly though, the most troublesome aspect of gross sales impact measures is captured in the following example:

> Two visitors spend $50,000 each in the economic region. One visits a local auto dealer and purchases a new luxury automobile. The other undergoes a medical procedure at the local county hospital. In terms of direct economic impact, both have spent $50,000. However, the expenditures will likely have very different meanings to the state economy. Of the $50,000 spent for the luxury automobile, perhaps $10,000 remains in-state as salesperson commissions and auto dealer income (part of the county's overall earnings), while the other $40,000 leaves the state for Detroit or somewhere else as wholesale payment for the new automobile. Contrast this to the hospital expenditure. Here perhaps $40,000 appears as

spending by broad expenditure category was bridged to the sectors of the statewide economy input-output model. Adjustments were made consistent with the model's regional accounts to allow for spending leakages.

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physician, nurse, and assorted hospital employee wages (part of the county's overall earnings), while only $10,000 leaves the state, to pay for hospital supplies, or to help amortize building and equipment loans. In terms of sales, both have the same impact, while in terms of earnings, the former has one-fourth the impact of the latter.

Table 4.3 expresses the impacts of New Jersey's CCs in terms of gross sales rather than earnings. Note that gross sales measures are everywhere larger than earnings. The economy-wide measure of total gross sales estimated by the economic model is $591.0 billion.[36] Direct local spending by students reflects their total spending, reduced by the estimated portion that leaks out-of-state to purchase goods produced elsewhere.[37] In the usual fashion, indirect effects reflect the action of local economic multiplier effects, also estimated by the economic model.

Direct state expenditures include all spending by the colleges for consumer items and for faculty and staff salaries. Both items are reduced to reflect purchases from outside the state. All told, the operation of the 19 colleges is estimated to explain some $17.1 billion in regional gross sales, a number substantially larger than the $7.0 billion explained by the colleges in regional gross earnings shown in **Table 4.2**.

While the gross sales impacts shown in **Table 4.3** are not incorrect, we prefer to report college impacts in terms of earnings (**Table 3.16**) rather than gross sales, because they reflect the economic realities in the state much more accurately. Advocacy studies, on the other hand, will often opt to express the results in terms of sales because the numbers are much more impressive. Such results, however, will likely not stand up to rigorous peer scrutiny in the economics profession.

[36] Simply stated, economy-wide gross sales are obtained by multiplying sector-specific regional earnings by a national estimate of sales-to-earnings.

[37] Students purchase gasoline for their cars, for example, and while the trade margin stays in-state, in most cases the producer price of gasoline itself will leak out to the oil-producing region.

Table 4.3. Summary of CCs' Role in the State Economy - Sales

	Gross Sales ($ Thousands)	% of Total
Total Gross Sales	$590,986,221	100%
Gross Sales Attributable to Student Spending		
Direct Spending by Students	$767,679	0.1%
Indirect Spending Effect	$877,620	0.1%
TOTAL	$1,645,299	0.3%
Gross Sales Attributable to College Operations		
Direct Expenditures of CCs	$228,083	0.0%
Indirect Spending Effect	$405,066	0.1%
TOTAL	$633,149	0.1%
Gross Sales Attributable to Past Student Econ. Dev. Effects		
Direct Gross Sales	$7,285,851	1.2%
Indirect Gross Sales	$7,582,189	1.3%
TOTAL	$14,868,041	2.5%
GRAND TOTAL	$17,146,488	2.9%

The Attrition Rate

The sensitivity analysis used here is a simple tool often used to determine "switching" values, which occur when the investment results turn from positive to negative, or from attractive to non-attractive as the assumptions are varied up and down. If the results change dramatically with only a small variation in the assumption, then that assumption is sensitive. If the results do not change much, the assumption is not sensitive, and minute accuracy in its specification is less important. The sensitivity analysis is also used to demonstrate how some results become unrealistic when advocacy assumptions are invoked.

One variable has consistently raised concerns among institutional researchers – the "Attrition Rate" variable, discussed in detail in **Table 2.2**. It cannot be specified on the basis of hard data collected on a regular basis by the colleges; rather, it is based on well-informed judgments made by faculty and staff intimately familiar with the student body. The attrition rate (20% in **Table 2.2**) characterizes the mobility of the exiting students out of the region over the next 30 years or so through retirement, out-migration and/or death. Given the nature of this variable and the difficulty in accurately specifying it, the obvious question is: how great a role does the attrition rate play in the magnitude of the results? The results are presented in the sensitivity analysis **Table 4.4**.

Table 4.4 Sensitivity Analysis of Attrition Rate Variable

	-75%	-50%	-25%	Base Case	25%	50%	75%
Attrition Rate Variable	5.0%	10.0%	15.00%	20%	25.00%	30.0%	35.0%
Regional Economic Development							
Earnings Attributable to College	$6,826,948	$6,669,001	$6,507,818	$6,343,104	$6,174,514	$6,001,646	$5,824,020
% of Total Earnings in State	3.0%	2.9%	2.9%	2.8%	2.7%	2.6%	2.6%
Credits Embodied in the Workforce	59,719,365	58,183,531	56,616,229	55,014,586	53,375,262	51,694,334	49,967,145

The attrition rate variable only affects the regional economic development results (**Table 3.16**). Variations in the attrition rate are calculated around the base case assumption of 20% (from **Table 2.2**), shown in the middle column of **Table 4.4**. We bracket the base case assumption on either side with plus or minus 25%, 50% and 75% variation in the assumptions. The analyses are then redone introducing one change at a time, holding all the other variables constant. Earnings attributable to the colleges, for example, range from a high of $6.8 million at -75% to a low of $5.8 million at a 75% variation from the base case assumption for this variable. This means that, if the attrition of the ex-students over time increases, the number of CHEs embodied in the current state workforce decreases; hence, the earnings attributable to the colleges decrease accordingly.

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Appendix 1: Explaining the Results—a Primer

The purpose of this appendix is to provide some context and meaning to investment analysis results in general, using the simple hypothetical example summarized in **Table 1** below. The table shows the projected (assumed) benefits and costs over time for one student and the associated investment analysis results.[38]

Table 1. Costs and Benefits

	Tuition	Opportunity Cost	Total cost	Higher Earnings	NCF
1	$1,500	$20,000	$21,500	$0	($21,500)
2	$0	$0	$0	$5,000	$5,000
3	$0	$0	$0	$5,000	$5,000
4	$0	$0	$0	$5,000	$5,000
5	$0	$0	$0	$5,000	$5,000
6	$0	$0	$0	$5,000	$5,000
7	$0	$0	$0	$5,000	$5,000
8	$0	$0	$0	$5,000	$5,000
9	$0	$0	$0	$5,000	$5,000
10	$0	$0	$0	$5,000	$5,000
NPV			$20,673	$35,747	$15,074
IRR					18%
B/C ratio					1.7
Payback period					4.2 years

The assumptions are as follows:

1) The time horizon is 10 years— i.e., we project the benefits and costs out 10 years into the future (Column 1). Once the higher education has been earned, the benefits of higher earnings remain with the student into the future. Our objective is to measure these future benefits and compare them to the costs of the education.

2) The student attends the CC for one year for which he or she pays a tuition of $1,500 (Column 2).

[38] Note that this is a hypothetical example. The numbers used are not based on data collected from any of the community colleges.

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3) The opportunity cost of time (the earnings foregone while attending the CC for one year) for this student is estimated at $20,000 (Column 3).

4) Together, these two cost elements ($21,500 total) represent the out-of-pocket investment made by the student (Column 4).

5) In return, we assume that the student, having completed the one year of study, will earn $5,000 more per year than he would have without the education (Column 5).

6) Finally, the net cash flow column (NCF) in Column 6 shows higher earnings (Column 5) less the total cost (Column 4).

7) We assume a "going rate" of interest of 4%, the rate of return from alternative investment schemes, for the use of the $21,500.

Now the "mechanics"—we express the results in standard investment analysis terms: the net present value (NPV), the internal rate of return (IRR—or, as referred to in the Main Report, simply the rate of return—RR), the benefit/cost ratio (B/C), and the payback period. Each of these is briefly explained below in the context of the cash flow numbers in **Table 1**.

The Net Present Value (NPV)

"A bird in hand is worth two in the bush." This simple folk wisdom lies at the heart of any economic analysis of investments lasting more than one year. The student we are tracking in **Table 1** has choices: a) to attend the CC, or b) forget about higher education and hold on to the present employment. If he or she decides to enroll, certain economic implications unfold: the tuition must be paid and earnings will cease for one year. In exchange, the student calculates that, with the higher education, his or her income will increase by at least the $5,000 per year as indicated in the table.

The question is simple: will the prospective student be economically better off by choosing to enroll? If we add up the higher earnings of $5,000 per year for the remaining nine years in **Table 1**, the total will be $45,000. Compared to a total investment of $21,500, this appears to be a very solid investment. The reality, however, is different—

the benefits are far lower than $45,000 because future money is worth less than present money. The costs (tuition plus foregone earnings) are felt immediately because they are incurred today—in the present. The benefits (higher earnings), on the other hand, occur in the future. They are not yet available. We must discount all future benefits by the going rate of interest (referred to as the discount rate) to be able to express them in present value terms.[39] A brief example: at 4%, the present value of $5,000 to be received one year from today is $4,807. If the $5,000 were to be received in year 10, the present value would reduce to $3,377. Or put another way, $4,807 deposited in the bank today earning 4% interest will grow to $5,000 in one year; and $3,377 deposited today would grow to $5,000 in 10 years. An "economically rational" person would, therefore, be equally satisfied receiving $3,377 today or $5,000 10 years from today given the going rate of interest of 4%. The process of discounting—finding the present value of future higher earnings—allows us to express values on an equal basis in future or present value terms.

Our goal is to express all future higher earnings in present value terms so that we can compare them to the investments incurred today—the tuition and foregone earnings. As indicated in **Table 1**, the cumulative present value of the flow of $5,000 worth of higher earnings between years 2 and 10 is $35,747 given the 4% interest rate, far lower than the undiscounted $45,000 discussed above.

The measure we are looking for is the NPV result of $15,074. It is simply the present value of the benefits less the present value of the costs, or $35,747 - $20,673 = $15,074. In other words, the present value of benefits exceeds the present value of costs by as much as $15,074. The criterion for an economically worthwhile investment is that the NPV is equal to or greater than zero. Given this result, it can be concluded that, *in this case*, and given these assumptions, this particular investment in CC education is very strong.

The Internal Rate of Return (IRR)

The IRR is another way of measuring the worth of the investment in education using the same cash flows shown in **Table 1**. In technical terms—the IRR is a measure of the

[39] Technically, the **interest rate** is applied to compounding—the process of looking at deposits today and determining how much they will be worth in the future. The same interest rate is called a **discount rate** when we reverse the process—determining the present value of future earnings.

average earning power of the money used over the life of the investment. It is simply the interest rate that makes the NPV equal to zero. In the NPV example above we applied the "going rate" of interest of 4% and computed a positive NPV of $15,074. The question now is: what would the interest rate have to be in order to reduce the NPV to zero? Obviously it would have to be higher—18% in fact, as indicated in **Table 1**. Or, if we applied 18% to the NPV calculations instead of the 4%, then the NPV would reduce to zero.

What does this mean? The IRR of 18% defines a breakeven solution—the point where the present value of benefits just equals the present value of costs, or where the NPV equals zero. Or, at 18%, the higher incomes of $5,000 per year for the next 9 years will earn back all the investments of $21,500 made plus pay 18% for the use of that money (the $21,500) in the meantime. Is this a good return? Indeed it is—first, if we compare it to the 4% "going rate" of interest we applied to the NPV calculations, 18% is far higher than 4%. We can conclude, therefore, that the investment in this case is solid. Alternatively, we can compare the rate to the long-term 7% rate or so obtained from investments in stocks and bonds. Again, the 18% is far higher, indicating that the investment in CC education is strong relative to the stock market returns (on average).

A word of caution—the IRR approach can sometimes generate "wild" or "unbelievable" results—percentages that defy the imagination. Technically, the approach requires at least one negative cash flow (tuition plus opportunity cost of time) to offset all subsequent positive flows. For example, if the student works full time while attending college, the opportunity cost of time would be much lower—the only out-of-pocket cost would be the $1,500 paid for tuition. In this case, it is still possible to compute the IRR, but it would be a staggering 333% because only a negative $1,500 cash flow will be offsetting 9 subsequent years of $5,000 worth of higher earnings. The 333% return is technically correct, but not consistent with conventional understanding of returns expressed as percentages. For purposes of this report, therefore, we express all results in the Main Report exceeding 100% simply as: "NA."

The Benefit/Cost Ratio (B/C)

The B/C ratio is simply the present value of benefits divided by present value of costs, or $35,747 / $21,500 = 1.7 (based on the 4% discount rate). Of course, any change in the

discount rate will also change the B/C ratio. If we applied the 18% IRR discussed above, the B/C ratio would reduce to 1.0—or the breakeven solution where benefits just equal the costs. Applying a discount rate higher than the 18 percent would reduce the ratio to less than one and the investment would not be feasible. The 1.7 ratio means that a dollar invested today will return a **cumulative** $1.70 over the 10-year time period.

The Payback Period

This is the length of time from the beginning of the investment (consisting of the tuition plus the earnings foregone) until the higher future earnings return the investments made. In **Table 1**, it will take roughly 4.2 years of $5,000 worth of higher earnings to recapture the student's investment of $1,500 in tuition and the $20,000 earnings he or she foregoes while attending the CC. The higher earnings occurring *beyond* the 4.2 years are the returns (the "gravy") that make the investment in education *in this example* economically worthwhile. The payback period is a fairly rough, albeit common, means of choosing between investments. The shorter the payback period, the stronger the investment.

Appendix 2: Methodology for Creating Income Gains by Levels of Education

The US Bureau of the Census reports income in two ways:

1) Mean income by race and Hispanic origin and by sex.

2) Educational attainment by mean income and sex.

The first and second data sets can be found at the following sources:

U.S. Census Bureau and U.S. Department of Commerce. Table P-3: Race and Hispanic Origin of People by Mean Income and Sex: 1947 to 2000, and Table P-18: Educational Attainment--People 25 Years Old and Over by Mean Income and Sex: 1991 to 2000. Also consult:

http://www.census.gov/ftp/pub/hhes/income/histinc/histinctb.html

Further contact information: a) Income Surveys Branch, b) Housing & Household Economic Statistics Division, c) U.S. Census Bureau, and d) U.S. Department of Commerce.

The data needed for this analysis is mean income by educational attainment reported by race/ethnic origin and by sex. A model was developed to translate these two data sets into the data needed for the analysis. This was accomplished in the following way:

1. Mean income by race and sex is calculated as a percent of all races.
2. This percent is then applied to mean income by educational attainment. For example, African-American males make an average income of $28,392 versus $40,293 for all males, or 70% of the average income of all males.
3. This percent (70%) is then applied to the income levels by educational attainment for all males to estimate the income levels by educational attainment for African-American males.

4. To simplify the analysis, all minority males are averaged together as are all minority females. The same process is repeated for white males and white females.

5. The educational levels of attainment are aggregated together in some categories to model the educational system of community colleges. These numbers are then adjusted for inflation to current year dollars.

6. The final step is to adjust these income levels by state. The *Four Person Median Family Income by State* from the Bureau of the Census was used to make state level adjustments. Each state's median family income is taken as a percentage of the national average. These percentages are then applied to the income levels by educational attainment by race, ethnicity, and sex, as calculated earlier.

Appendix 3: Adjusting for the Benefits Available Absent State and Local Government Support

Introduction

The investment analysis presented in the Main Report weighs the benefits of CC enrollment (measured in terms of CHEs) against the support provided by state and local government. If, without state and local government support a CC would have to shut its doors, then it is entirely appropriate to credit all the benefits to that support. This brings up the question: is it in fact true that the CC would have to close its doors absent state and local government support? Increased tuition could almost certainly make up for some of the lost funds, although this would result in reduced enrollment. Still, if the school could remain open and operate at this "zero state and local government support level," then state and local government support can only be credited with the difference; i.e., the actual enrollment less the enrollment at zero state and local government support. This appendix documents our procedures for making these adjustments, which feed the broad and narrow taxpayer benefit/cost ratios, rates of return, and payback analyses estimates in the Main Report.

State and Local Government Support Versus Tuition

We start by exploring the issue with the aid of some graphics. **Figure 1** presents a simple model of student demand and state and local government support. The right side of the graph is a standard demand curve (D) showing student enrollment as a function of tuition and other student fees. Enrollment is measured in total CHEs and expressed as a percentage of current CHEs. The current tuition rate is p', and state and local government support covers C% of all costs. At this point in the analysis, we assume that the CC has only two sources of revenues, student tuition payments and state and local government support.

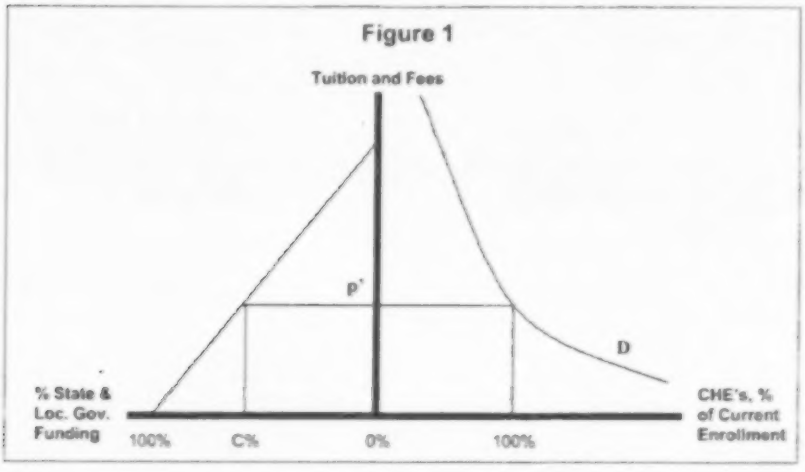
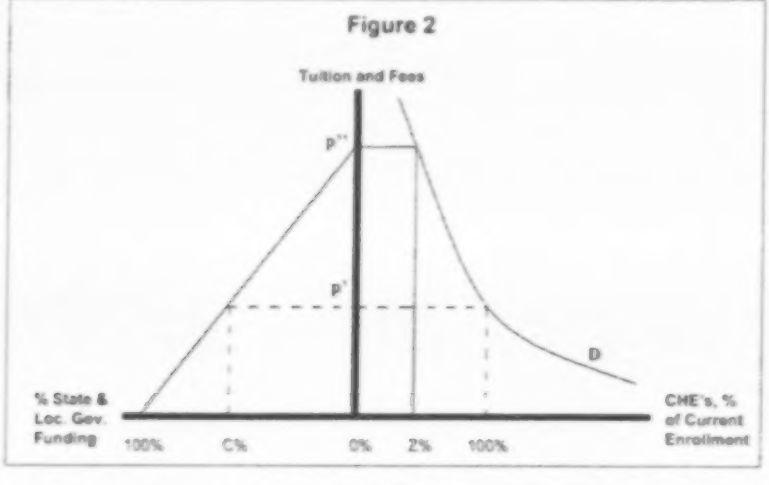


Figure 2 shows another important reference point in the model – where state and local government support is 0%, tuition rates are increased to p", and enrollment is Z% (less than 100%). The reduction in enrollment reflects price elasticity in the students' school vs. no-school decision. Neglecting for the moment those issues concerning the CC's minimum operating scale (considered below in the section on "The CC Shutdown Point"), the implication for our investment analysis is that the benefits of state and local government support for the CC must be adjusted to net out the benefits associated with a level of enrollment at Z%; i.e., the school can provide these benefits absent state and local government support.



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FROM ENROLLMENT TO BENEFITS

This appendix is mainly focused on the size of CC enrollment (i.e., the production of CHEs) and its relationship to student versus state and local government funding. However, to clarify the argument it is useful to briefly consider the role of enrollment in our larger benefit/cost model.

Let B equal the benefits attributable to state and local government support. B might be understood as applying to either our broad or narrow taxpayer perspectives. The analysis in the Main Report derives all benefits as a function of student enrollments (i.e., CHEs). For consistency with the graphical exposition elsewhere in this appendix, B will be expressed as a function of the percent of current enrollment (i.e., percent of current CHEs). Accordingly, the equation

(1) $B = B(100\%)$

reflects the total benefits generated by enrollments at their current levels, measured in our Main Report and shown in **Table 3.7** for the broad taxpayer perspective, and in **Table 3.8** for the narrow taxpayer perspective.

Consider benefits now with reference to **Figure 2**. The point where state and local government support is zero nonetheless provides for Z% (less than 100%) of the current enrollment, and benefits are symbolically indicated by:

(2) $B = B(Z\%)$

Inasmuch as the benefits in (2) occur with or without state and local government support, the benefits appropriately attributed to state and local government support is given by:

(3) $B = B(100\%) - B(Z\%)$

THE CC SHUTDOWN POINT

CC operations will cease when fixed costs can no longer be covered. The shutdown point is introduced graphically in **Figure 3** as S%. The location of point S% indicates that this particular college can operate at an even lower enrollment level than Z% (the point of zero state and local funding). At point S%, state and local government support is still zero, and the tuition rate has been raised to p'''. At tuition rates still higher than p''', the CC would not be able to attract enough students the keep the doors open, and it would shut down. In **Figure 3**, point S% illustrates the CC shutdown point but otherwise plays no role in the estimation of state and local government benefits. These remain as shown in equation (3).

Figure 3

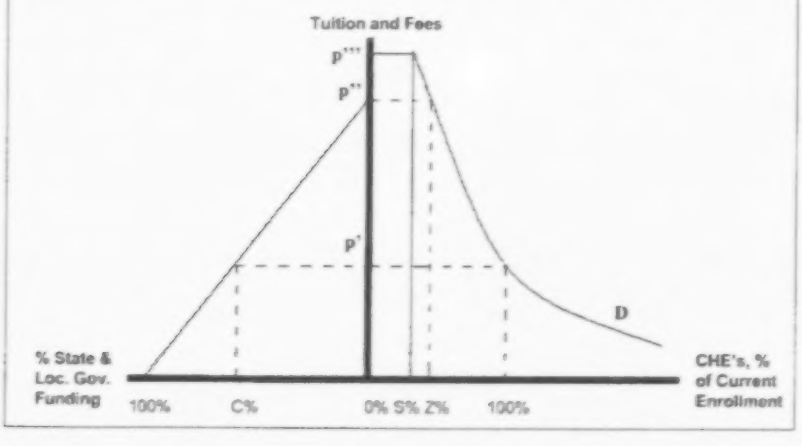

Figure 4 illustrates yet another scenario. Here the CC shutdown point occurs at an enrollment level greater than Z% (the level of zero state and local government support), meaning some minimum level of state and local government support is needed for the school to operate at all. This minimum portion of overall funding is indicated by S'% on the left side of the chart, and as before, the shutdown point is indicated by S% on the right side of chart. In this case, state and local government support is appropriately credited all the benefits generated by CC enrollment, or B=B(100%).

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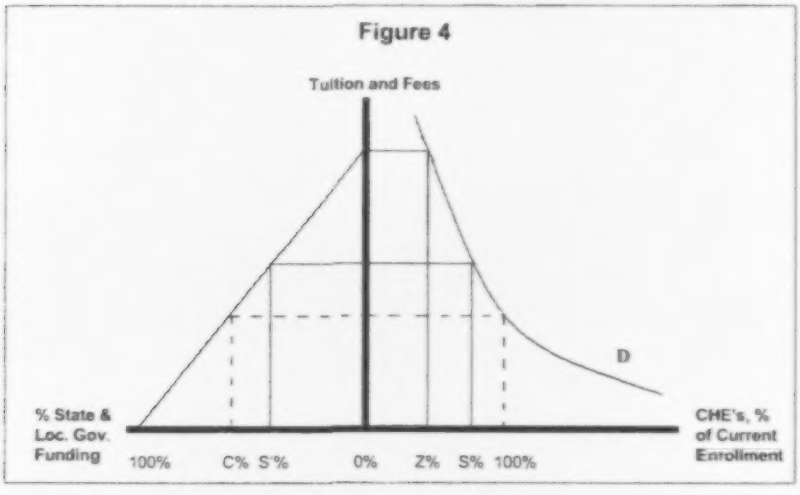

ADJUSTING FOR ALTERNATIVE EDUCATION OPPORTUNITIES

Because there may be education alternatives to the CC, we must make yet another adjustment. The question asked is: "Absent the CC, what percentage of the students would be able to obtain their education elsewhere?" The benefits associated with the CC education of these students are deducted from the overall benefit estimates.

The adjustment for alternative education is easily incorporated into our simple graphic model. For simplicity, let A% equal the percent of students with alternative education opportunities, and N% equal the percent of students without an alternative. Note that: N% + A% = 100%. **Figure 5** presents the case where the CC could operate absent state and local government support (i.e., Z% occurs at an enrollment level greater than the CC shutdown level S%). In this case, the benefits generated by enrollments absent state and local government support must be subtracted from total benefits. This case is parallel to that indicated in equation (3), and the net benefits attributable to state and local government support is given by:

(4) $B = B(N\%100\%) - B(N\%Z\%)$

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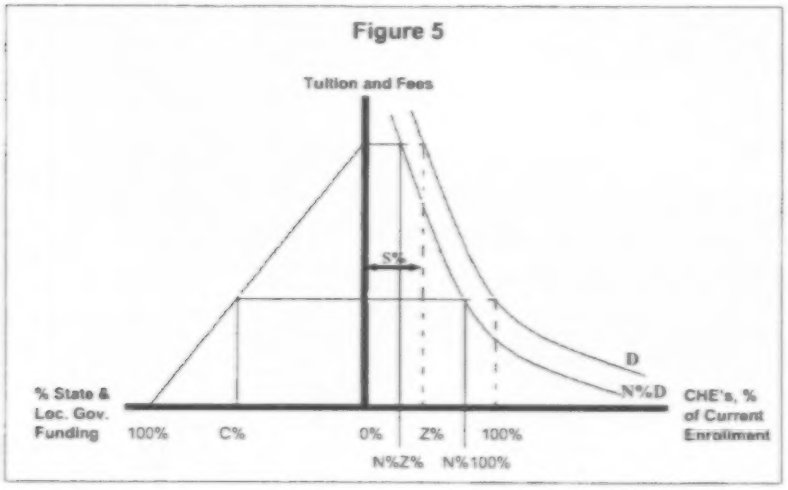
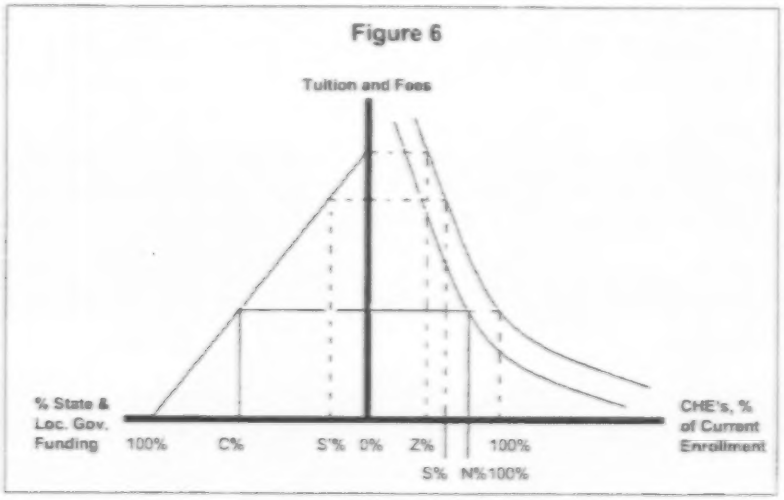


Finally, **Figure 6** presents the case where the CC cannot remain open absent some minimum S'% level of state and local government support. In this case the CC is credited with all benefits generated by current enrollment, less only the percent of students with alternative education opportunities. These benefits are represented symbolically as B(N%100%).



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Executive Summary

The Socioeconomic Benefits Generated by New Jersey's 19 Community Colleges

The New Jersey Council of County Colleges contracted with CCbenefits, Inc. to undertake a first ever statewide economic impact study for New Jersey's 19 community colleges. The study used a comprehensive economic model, which was field tested at over 300 different community colleges throughout the U.S. and Canada, and then applied to New Jersey's community colleges. It relies on data collected from each New Jersey community college to determine the overall economic impact of New Jersey's community college system to students, the state's economy, taxpayers, and state and county governments.

Benefits to Students
Students enjoy many benefits because of their attendance at a community college. Those who complete an associate degree will earn nearly $400,000 more in additional lifetime income over the course of their careers. This is 36.5 percent more than people with only a high school diploma or GED. Students earning a one-year certificate from a community college earn as much as 16.1 percent more than people with only a high school diploma or GED. And even those who enroll part-time can expect to earn about $500 per year for each community college course they complete.

Benefits to the State's Economy
Ninety-five percent of community college students stay in New Jersey and join or rejoin the state's workforce after leaving college. Their added skills contribute to a more robust state economy, which means higher earnings and increased business revenues throughout the state. More specifically, New Jersey's annual workforce earnings are $6.3 billion greater (the equivalent of over 135,000 jobs) due to the past and present operations of community colleges. And New Jersey's business sales are $16 billion larger because of community colleges.

Benefits to Taxpayers
The benefits of government-funded programs are often expressed through a common sense benefits-to-cost ratio. A ratio of less than one indicates that a public project is not worthwhile, while a ratio greater than one is generally considered to be economically sound. For example, a transportation project is justified if the savings in travel time and vehicle expenses (the benefits) exceed the project's cost. This investment perspective can be applied to community colleges by examining a wide range of benefits including the increased earnings of students plus other indirect social benefits associated with higher education such as reduced expenditures on crime, reduced welfare expenditures, savings on health care, reduced unemployment expenditures, and reduced costs associated with absenteeism from work. Tallying these many benefits in comparison to public funding to community colleges shows that for every tax dollar invested in New Jersey's community colleges over $18 dollars in overall benefits are returned throughout the state – an impressive 18-to-1 benefits-to-cost ratio.

Benefits to Government
Even when more narrowly considering only the direct benefits to state government (i.e. moneys returned directly to the state treasury) – for example, the higher taxes paid by students – the benefits due to community colleges are impressive. Economists sometimes look for a 4 percent rate of return on government projects, assuming that governments typically can receive that rate when investing excess funds. In reality, many public projects routinely generate negative rates of return because it is the role of government to provide services that the public wants but the private sector finds unprofitable. By way of comparison, the rate of return on tax money invested in community colleges is an impressive 13.9 percent. In short, the state government actually makes money by funding community colleges – the colleges put more money back into the state treasury than they take out!

For a full copy of "The Socioeconomic Benefits Generated by New Jersey's 19 Community Colleges," please call Jacob C. Farbman, New Jersey Council of County Colleges, at (609) 392-3434.

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